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A MONTHLY REVIEW OF VETERINARY SCIENCE

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The Veterinary Journal.

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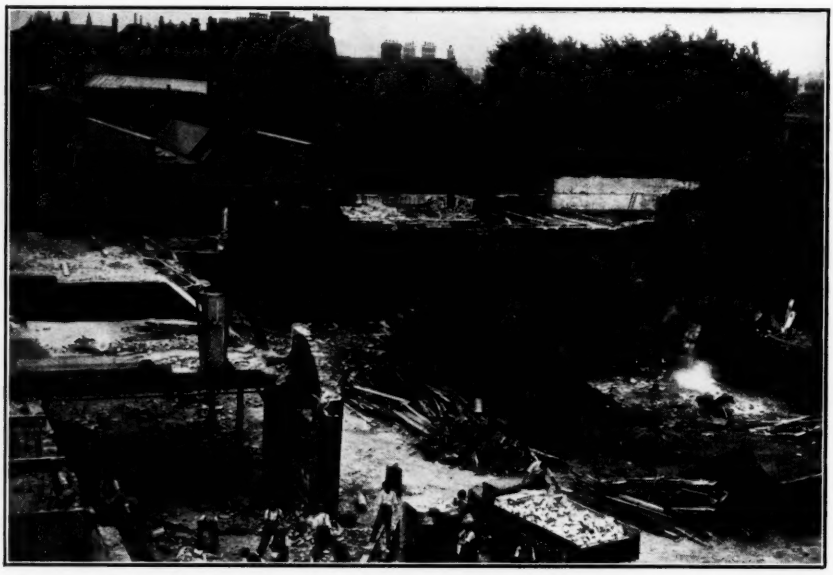

The Royal Veterinary College.—Further demolition of the old place.

The Royal Veterinary College.—The old quadrangle site cleared for the new laboratory buildings.

THE

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FEBRUARY, 1935.

Editorial

THE SAFETY AND PURITY OF MILK.

THE subject of the safety and purity of milk still keeps as much to the fore in the lay press as it does in that of the professional journals; and it does really seem as if at last the public are awakening out of their deadly apathy and that the Government are going to exert their authority to, at any rate, get rid of the tuberculous cow.

The importance of the part to be played by the veterinary profession cannot be too strongly emphasised, and is recognised alike by our brother medicals and the Public Health Department of the Government. It now remains for us to rise to the occasion, and this will be done in so far as our numbers will permit. Up to the present the situation has been met extremely well, but the leaders of the profession are compelled to admit that the supply is not inexhaustible, and are looking to the teaching colleges and the Board of Examiners to see that the right type of man enters through our " one way street "—the one portal system which we guard so jealously.

It is interesting to note how the type of student in our colleges has changed during the past twenty years; especially in the past decade. In the old days the students were drawn largely from the sons of veterinary surgeons, farmers, large owners of stock, dairymen, etc., and were quite contented to obtain the one diploma which merely gives the licence to practice. Nowadays only a few are happy with this diploma alone, and take, in addition, the University B.Sc., or one of the post-graduate courses which lead to the Diploma of Veterinary State Medicine; or, if proceeding abroad, that of Tropical Medicine.

The effect of this is already making itself felt in social circles, amongst which the veterinary surgeon rarely seriously attempted to mix before; and social

efforts must never be lost sight of if the best results are to be attained in regard not only to status, but also to progress.

The National Association for the Prevention of Tuberculosis, which meets at Southport, June 27th to 29th, has this year selected as the chief title for discussion "The responsibility of the nation towards the child in respect of tuberculosis," and the subject (which concerns the veterinary surgeon equally with the medical man) is to be discussed from various angles at the respective sessions. For example, on the opening day (Thursday, June 27th), the headings for the day's discussions are as to how the child may be safeguarded (1) against human infection at home, at school, etc., and (2) against bovine infection, with special reference to the milk supply. It is in regard to the latter that it is hoped the veterinary profession will attend and speak at the Congress; and although by the date of the Congress (June 27th to 29th) the effort which the Government has now started in regard to the inspection of dairy cattle and dairy herds will hardly have got into its stride, the work will have made a serious commencement, and more will be known in regard to its practicability and the help to be expected from the dairyman and owner of stock. All over the country the necessity for this is recognised, and it is for the medical officer to rigidly enforce in particular the regulations which govern the "Milk for School Children" slogan, thereby supporting the efforts of the veterinary profession in its desire to be able to eradicate the origin of tuberculous milk—the tuberculous cow.

BREEDING OF HORSES IN IRELAND.

ACCORDING to reports which have reached us from Northern Ireland in regard to the subject of horse breeding, the demand at the present moment exceeds the supply, especially in regard to the class of horse used for short journeys and city work. This again confirms what has already been stated on numerous occasions before, *viz.*, that for certain classes of work the horse is a more economical problem than motor traction, but for the long-distance journeys, however, the motor will always hold the palm.

FURTHER NOTE ON THE NEW COLLEGE BUILDINGS IN CAMDEN TOWN.

WE draw the attention of old graduates who still take interest in their *Alma Mater* to two more photographs recently taken, which illustrate a still further stage in the progress made. The one, which looks like one of the bombed areas during the late War, was taken during the process of demolition of the pharmacy, offices, loose boxes, and pathological laboratory and museum in the middle quadrangle; and the second one shows the ground cleared preparatory to receiving the large girders and steelwork which is to form the framework of the chief laboratory buildings, offices, and large assembly hall. Within a few days the whole of the open space will be full of workmen, and, indeed, a hive of industry; the ultimate result being, we hope, the most up-to-date and best-equipped Veterinary Hospital and College in the world.

General Articles

ELECTRIC METHODS OF PRODUCING HUMANE SLAUGHTER *

By SIR LEONARD HILL, M.B., LL.D., F.R.S.

In 1882, Benjamin Ward Richardson founded the Model Abattoir Society to promote the use of public slaughter-houses, to secure adequate inspection, and to require the adoption of the healthiest, most convenient and most humane method of killing animals for food, and the observance of sanitary procedure; but as early as 1869 he was experimenting with electrocution as a method of slaughtering, a method which had been tried by Benjamin Franklin. His great aim was to secure narcosis by this means, or by inhalation of some lethal gas such as carbon monoxide, before the sticking of animals was carried out. How greatly then would he have welcomed the advent of the electric stunning instrument. In this lecture his aims for humane slaughter will, I think, be shown fulfilled. It only remains to make the use of the electric process universal, for it is safe and free from all the objections made against shooting.

Leduc,[1] in 1903, showed that when a direct current, drawn from a battery and interrupted 100–150 times a second, passed from the spine to the head of a dog, it produced, if of sufficient strength, complete anæsthesia. Tonic and clonic spasms, emptying of bowel and bladder, and temporary stoppage of breathing might be concomitant effects, but by a slow and steady increase of the current these could be avoided, and the animal could then be kept for an hour or more completely anæsthetised, and no apparent harm follow. Leduc attributed the spasms to excitation of the motor areas of the cortex, and supposed that an inhibition of the higher cerebral functions resulted in anæsthesia, while Boruttau,[2] who confirmed Leduc's experiments, suggested that the electrical excitation of the nervous system prevented the normal excitation of the centres of association. The loss of consciousness produced by the electrical current has also been compared with that which occurs on the onset of an epileptic fit, and an explanation of each sought in a supposed spasm of the cerebral blood vessels. Of this there is no proof. By others the loss of consciousness has been attributed to alteration in the normal equilibrium of acid and alkaline ions in the tissue—fluid of the brain. The cause still remains undecided. The details of an experiment carried out by Jacobi and Magnus[3] shows how anæsthesia is produced by electrical means. At 8.42 a dog was submitted to a current of 30 milliamperes, tonic spasms resulted but soon ceased, and anæsthesia was then found to be complete; the reflexes

*Thirteenth Annual Benjamin Ward Richardson Memorial Lecture of the Model Abattoir Society, given in the Lecture Hall of the Royal Sanitary Institute, on Tuesday, November 27th, 1934.

were lost, and the pupils widely dilated and not reacting to light ; the breathing was slow and of moderate depth. At 8.46 the dog woke up ; the electrodes were again made wet with saliva, and narcosis once more made complete. At 9.2 the electrical induction of narcosis was interrupted, the pupils became reactive to light, but the dog remained anæsthetic ; at 9.17 it began to move and at 9.21 it tried to get up. At 9.22 narcosis was again induced, and the pupils became wide and ceased to react to light ; at 9.23 the induction of narcosis was once more interrupted, and at 9.24 the pupils reacted to light. At 9.25 narcosis was again made complete. At 9.43 the dog once more became awake, to be re-narcotised at 9.48. At 9.54 the induction of narcosis was interrupted, but the breathing had by then stopped and the animal died.

Leduc twice submitted himself at the hands of his colleagues to the electrical current, but this was not increased to the point when spasms occur. He felt and heard as in a dream, but could not move. The observers thought he was anæsthetised, but they had not made the current strong enough. His symptoms were similar to those in the first stage of an anæsthesia produced by inhalation of nitrous oxide or ether.

On account of these two experiments made on Leduc himself, and of some others of a similar kind made by Hertz, whose subjects recovered the power of speech as soon as the current was turned off, it has been asserted that the electrical method does not produce true anæsthesia, but only a condition of muscular spasm and inability to move. There is, I think, no truth in such an assertion. The condition of Leduc and Hertz subjects was the same as those in the first stage of anæsthesia. We know that a lightning stroke, or one from a high-powered electric current, produces instant loss of consciousness. All that a colleague of mine remembers who suffered such a stroke is a sudden blow, and then he was down and out. An electric shock may kill by throwing the heart into delirium, or by paralysing the respiration ; should the current pass through parts of the body other than the brain and heart, consciousness may, of course, persist together with spasm of muscles, as many electricians have experienced. Spasms result when the current is passed through the brain, but these no more denote consciousness than the spasms which result when an animal is shot in the brain with the captive bolt, but no one infers that these are signs of consciousness. Any sudden interruption of the blood supply to the brain, as by occlusion of both carotid arteries, causes convulsive movements, but on such occlusion as we know by human experience, consciousness is instantly lost. It is stated that the electric method of producing narcosis causes congestion and œdema of the brain, and tissue changes which precede the bleeding of the animal to death by the cutting of its throat. Against these changes being of importance is the fact that animals can be anæsthetised by means of electric stunning instruments for a short period and recover completely, and appear to behave as normal animals. Moreover, operations can be performed, such as castration, as I have myself observed, with no other anæsthesia than that produced by the electro-lethaler, the application of

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this being made in successive doses, as needed, just as is done in the case of chloroform anæsthesia.

It has been shown that when those animals which survive an electric shock of a strength lethal to most, are again shocked, and the survivors from this second shock are once more shocked, and so on, there finally remain some animals which are wholly immune to a strength of a shock which was at the start fatal to most. This is a remarkable fact. It shows that the action on the nerve cells, which in most animals produces death by failure of respiration, is inhibitory and not destructive.

I have watched dozens of pigs being anæsthetised by the electro-lethaler in a most easy and perfect way. After each one was narcotised it was hoisted, stuck and bled without struggle or squeal; the slaughter-house was thus made a place of peaceful quiet. The current was obtained from the usual 200 volt, 50 cycle A.C. lighting circuit, and was reduced to 50 volts by a transformer. The electrodes were at the end of the jaws of a tong-like instrument, and after soaking in 20 per cent. saline, were applied, in the case of pigs, one on each side of the animal's head close behind the lower jaw, and in the case of calves and sheep, between the eye and ear. The current was switched on by pressing a button on the handle of the tongs. Immediately this happens a pig closes its eyes and tilts its head upwards; the fore-legs become extended, the hind limbs contracted, the animal sinking into a sitting position and then falling over on to its side. At this stage one can feel the trembling of the muscles. In some cases the bladder and rectum may be emptied.

The application of the current is for five to six seconds, even two seconds suffice for small pigs. When the current is shut off the animal lies unconscious with the limbs relaxed and the eyes open; the corneal reflex is absent in some cases and present in others. The pig then is hoisted on a wheel by a shackle placed round one foot and passed to the slaughterer, who sticks it for bleeding. There is no struggling while the animal is bled, the heart and respiration are in action the whole time, and the blood flows freely. There is no sign of a return to consciousness, and no evidence that the pig suffers pain when stuck.

Such is the ideal method of slaughter used at the bacon works of Messrs. Marsh & Baxter, and observed by Sir F. Hobday, Principal of the Royal Veterinary College, Professor Symes and myself. We were all convinced of the complete anæsthesia of the pigs.

The older method of electrocution caused violent contraction and even rupture of and hæmorrhage into muscles. This is entirely avoided by the modern method, and no blood splashing occurs. Edington and Elliott[4] have shown that the meat of pigs slaughtered by the new device contains even less blood than that of those stuck without previous narcosis, and distinctly less than the meat of those that are shot and then stuck. Taking the blood content of the muscles of pigs killed by shooting and delayed bleeding as 100, that of pigs killed by direct bleeding is 70, and of pigs narcotised by the electro-lethaler and then stuck,

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as 60. There should be advantage, then, in this method to the Jews, who by their ritual have to obtain bloodless meat.

When the current is shut off breathing proceeds, and if the animal be left to recover, after about two minutes it regains its feet, exactly as if it were recovering from nitrous oxide anæsthesia, and in a leisurely manner walks around apparently unperturbed by its experience.[5]

Owing to the lack of struggling when stuck, no blood is spilt. The volume of blood available for black puddings has thus increased since the adoption of the electro-lethaler. The internal organs are indistinguishable from those taken from the carcases of pigs bled without the electrical induction of narcosis. No splashing is visible, and bacon, when cured, is of best quality.

In the case of sheep and calves, the tongs are applied for two to four seconds between the ears and eyes, the operator standing in front of the animal. When the operator is working single-handed the sheep is laid on a crutch. A rope fixed to the crutch rather nearer to the tail end than the head is brought over the sheep and secured nearer the head. The electrical resistance of the sheep's wool and calve's hair is overcome by use of rubber sponge attached to the metal electrodes, which have been immersed in saline before application.

In the case of the electric stunner, made by Messrs. Cooper-Stewart, the electrodes incorporate a drenching valve which, by releasing saline at the moment of contact, ensures perfect conduction. Either electric stunning apparatus, in the words of the *Veterinary Record* (April 23rd, 1932), " provides a seemingly ideal preliminary to painless slaughter."

The upkeep and maintenance of such apparatus has been found by Mr. Tweed (Chief Veterinary Inspector of Sheffield) to be less than that of guns and cartridges. We are told that in Germany, Austria and Czecho-Slovakia over forty million pigs have been electrically stunned in one year, and that sums have been saved in abattoirs up to £750 to £1,000 per year, which were previously spent on ammunition. In the case of cattle, the animal's head is first pulled down close to a ring set in the floor. The tongs are then placed between the eye and ear of the animal. The beast at once falls on its knees. The current should be applied for about 20 seconds ; after removal of the tongs the animal can easily be levered over on to its side and then stuck. It is claimed that the electric stunner is especially efficient for stunning grown cattle. Delay in bleeding may be caused by spasmodic movements of the forelimbs. In stunning by the captive bolt a hole is left in the skull through which the animal can be pitted with the help of a cane, and the convulsive movements thus at once put an end to. The electric stunning instrument might well be combined with the use of the pole-axe and the cane. The pole-axe would be used when the animal sinks on to its knees. Very little time would be lost before sticking. Such use of a pole-axe is, of course, against the Jewish ritual.

When pigs are shot by the captive bolt, convulsive movements follow, and there is delay in hoisting and sticking the animal. The shot animal at once

ceases to breathe and its heart may be inhibited. There is, then, less effective bleeding, and splashing may occur in the flesh.

There are a few microbes present in the blood of a pig, and these multiply fast after death in any blood left behind in the vessels. Thus the curers of our finest bacon and hams insist that the captive bolt method cannot yield the best results. Mr. Tweed (Chief Veterinary Inspector of Sheffield), therefore, hoisted the animals before shooting. Whatever fright and discomfort are caused will, however, be due to hoisting, so this procedure nullifies the advantage of shooting. Everyone who has received a big wound in battle, and every surgeon who has observed wounded men, knows that a sudden wound, such as is inflicted in cutting of the throat by the Jewish method, is not felt. It may, however, justly be said that hoisting an animal by one leg in the case of the pig, and hoisting it and throwing it over in the case of the ox, causes discomfort. It must be borne in mind that the condition of surprise and confusion produced by such an operation, judging from men, must very largely prevent such discomfort being fully realised before the throat is cut, when unconsciousness is almost instantly produced by the loss of blood from the cortex of the brain. Many suppose that the movements of the head, legs and tail which quickly follow the cutting of the throat and the efforts of raising of the head and body from the recumbent position which may occur in the case of an unfastened beast, likewise the presence of the corneal reflex, and the deep, noisy respiration, are signs of consciousness. It is asserted that this consciousness is brought about by a compensatory supply of blood by way of the vertebral arteries.

In veterinary circles the assertion of a persistent or returning consciousness and capacity of feeling of pain is based on the fact that the unfastened beast may make efforts to get up and escape. The opinion, however, of all leading physiologists, including that of our world-wide authority on the nervous system, Sir Charles Sherrington, is that these movements are merely signs of reflex action carried out by the lower nerve centres. They are seen in pigeons, rabbits, cats and dogs after removal of the great brain. Human experience of anæsthesia shows that the sensory areas of the great brain are far more sensitive than the lower centres; so, too, in the case of an interference with the supply of blood and oxygen to the brain. A monkey shuts its eyes and goes to sleep when the oxygen supply is greatly diminished in the air which it breathes: it continues to sit and balance its movements; but it is at first difficult and then impossible to wake it up and make it open its eyes. Later, with still less oxygen supply, the motor centres fail, and the animal falls over and convulsive movements occur. Convulsive escape movements are made when the oxygen is greatly and rapidly diminished, but the animal is by then unconscious. The first sign of a dangerous lowering of oxygen in man is loss of consciousness, and this occurs suddenly and without warning. Hence the danger of breathing deoxygenated air in wells, mines, etc., exhaust fumes in garages, and coal-gas escaping in rooms.

The fact that the volume of the brain, as seen through a trephine hole, at once

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shrinks on severance of the carotid arteries and does not recover, shows that there is no compensatory return of circulation by way of the vertebral arteries. When a big water-pipe bursts in the basement of a house, not a drop reaches the taps in the upper stories. So when the carotids are severed the pressure in the axillary arteries from which the vertebrals arise falls away to almost *nil* and flow ceases. The vertebral arteries in cattle make, outside the skull, large anastomoses with the carotid arteries; any blood brought by them, therefore, flows out of the peripheral end of the severed carotid arteries, and does not reach the brain. Experiment has shown that this is so. I observed in an anæsthetised calf that the pressure in the circle of Willis fell rapidly towards zero within ten seconds of cutting the carotid arteries.

Bougert, experimenting on a calf under local anæsthesia, tied the cervical and vertebral arteries at the level of the transverse processes of the seventh cervical vertebra. The calf, after the operation, got up on its feet and drank water. It was then cast and slaughtered by the Jewish method and at once loosened. The animal made escape movements, and showed a corneal reflex. When its mouth was put in a pail containing a mash of meal and water, it made swallowing movements, the meal escaping from the severed gullet. The calf behaved just as a pigeon which, after the great brain has been removed, swallows a grain of corn placed in its beak. The brainless pigeon, of course, never seeks food for itself. A calf, with every possibility of blood supply to the brain removed, and consciousness and sensibility to pain, therefore, completely abolished, makes then co-ordinated limb movements, escape movements, liftings of head and tail, shows a corneal reflex, and swallows food in which its mouth is put.

It has been shown that the motor areas of the cerebral cortex become unexcitable by the Faradic current within 10 to 30 seconds after the cutting of the carotid arteries. In man the loss of consciousness is immediate on compression of the carotids, as the garrotter well knew. He put his arm round, and squeezed the neck of the victim, abstracted his gold watch and chain and then ran off, leaving his victim on the ground to recover from a sudden faint. The great danger of boys playing at hanging is that the pressure of the rope may cause sudden loss of consciousness: they may suffocate.

The sticking of animals with a short knife is not as efficient as the Jewish method, whereby the beast is held recumbent while the neck is stretched and cut back to the spine without pressure or pulling, by a long broad blade, kept sharp enough to cut a hair.

There is no question that, given a proper method of casting, the Jewish method of slaughter is efficient, painless and humane. Any statement to the contrary is founded on ignorance and false sentiment. But, given suitable methods of casting and confining the forelimbs, the Jews might avoid any possibility of reproach by using electric narcosis for cattle, just as they could now use it for calves and sheep, so soon as they agree that it does not go against their ritual. To satisfy the Jewish ritual, it must be proved that no tissue damage is done

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by the electric stunning process. Exact research on the nerve cells of the brain can settle this question. To sum up, the electric stunning instrument takes away all the struggling and discomfort produced by casting, and makes the method of slaughter free from all objection.

REFERENCES.

[1] *Arch. d'Electr. med.*, 1903, **521**, and 1904, 771.
[2] *Zeit. Neur. Psych.*, 1923, **83**, 284.
[3] *Zeit. Neur. Psych.*, 1925, **98**, 708.
[4] *Veterinary Record*, 1931, **31**, 1303–4.
[5] *Veterinary Record*, February 12th, 1932.

AN OUTBREAK OF FOWL CHOLERA IN SCOTLAND.

By J. E. WILSON,

Department of Poultry Diseases, Royal (Dick) Veterinary College, Edinburgh,

AND

D. R. WILSON,

The Moredun Institute, Animal Diseases Research Association, Edinburgh,

THERE have been few authentic records of the occurrence of fowl cholera in Great Britain. Doyle (personal communication) records an outbreak amongst some geese imported from Poland in 1922, and two outbreaks in Lancashire in 1926–27. No secondary outbreaks occurred in these cases. He also mentions the widespread outbreak of 1933 in Norfolk and Suffolk, with secondary outbreaks in various parts of the South of England ; a further outbreak in 1933 in Northern Ireland and one in the same year in Northern Wales are noted.

Dobson (personal communication, 1934) discusses the 1933 outbreak in which the disease was believed to be introduced by a consignment of Polish geese, which commenced to die shortly after arrival, with ultimate heavy mortality.

Gordon (1924) investigated an outbreak at Beaminster, and Warrack and Dalling (1932) described four outbreaks, all subacute in character. They did not meet with the disease in its epizootic form and consider that fowl cholera may be more common in England than is generally believed.

In February, 1934, our attention was drawn to an outbreak of the disease in East Lothian. The affected birds belonged to a consignment received from Colchester in December, 1933. Two birds were dead on arrival and many deaths occurred during the following two months before professional advice was sought. The symptoms varied. In the majority of cases none was evident, the affected birds being found dead on the floor of the house or in the nests. Several of the birds showed evidence of nasal catarrh, while others stood about in a drowsy condition with ruffled feathers and refused food. In some cases great thirst, accompanied by depression and diarrhœa, was noticed. In many instances the birds continued to lay right up to the time of death.

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In the flock, which consisted of 500 birds, 350 died, and the remainder were ultimately destroyed. Six birds were examined post-mortem. In each case the carcase was in good condition; the most noticeable lesions were numerous pin-point areas of necrosis of the liver, petechiæ on the heart, and a pneumonic condition of the lungs. The acute hæmorrhagic enteritis usually described as typical of fowl cholera was not present.

Examination of films of the heart blood, stained by methylene blue or Giemsa, revealed numerous bipolar staining organisms which proved to be *Pasturella aviseptica*. Pure cultures of the organism were obtained from the liver and heart blood, and inoculation experiments were carried out with fowls, pigeons, rabbits, guinea-pigs and mice. A saline suspension, corresponding in opacity to No. 2 on Brown's scale, was prepared from a twenty-four hours old agar culture. A series of dilutions from this suspension were made to one in ten million. Each of the test animals received 0.5 c.c., the rabbits, guinea-pigs and mice being inoculated intravenously, the fowls and pigeons subcutaneously. The suspensions were pathogenic for rabbits and guinea-pigs up to one in one million dilution, but were not tested in higher dilutions; for mice, pigeons and fowls, they were pathogenic up to one in ten million dilution. Blood from the natural cases in a dilution of one in one hundred was found to be virulent for fowls, pigeons, rabbits, guinea-pigs and mice.

Control Measures.

Since the death-rate had been considerable, and it seemed probable that many other deaths would occur, together with the fact that the farm was in the midst of several poultry farms and was separated from two others merely by a wire fence, it was deemed advisable to slaughter the remainder of the flock. The houses, utensils, etc., were thoroughly disinfected and the ground treated with quicklime in the proportion of three tons to the acre. So far as we are aware, no secondary outbreaks took place, and the farm has been restocked without recurrence of the disease.

Discussion.

The foregoing appears to be the first record of the occurrence of fowl cholera in Scotland. When the origin of the affected birds is considered, it seems probable that this outbreak was a secondary one from the 1933 epizootic in Norfolk and neighbouring counties. In dealing with such an outbreak as this, one finds oneself gravely handicapped by the lack of legislative measures, and it seems very desirable that powers should be sought for the compulsory control of fowl cholera and other infectious diseases of poultry.

Acknowledgments.—We have to thank Captain T. M. Doyle and Mr. Norman Dobson, research officers, Ministry of Agriculture and Fisheries, and Mr. W. A. Pool, Deputy Director, Imperial Bureau of Animal Health, for information and

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references regarding outbreaks of fowl cholera in Great Britain; we have also to record our appreciation of the care with which Mr. G. Annat, of the Moredun Institute, prepared the microphotographs.

REFERENCES.

Gordon, A. K. (1924): "An Outbreak of Chicken Cholera." THE VETERINARY JOURNAL, **80**, 26-28.
Warrack, G. H., and Dalling, T. (1932): "Fowl Cholera in England," THE VETERINARY JOURNAL, **88**, 26–28.
Dobson, N. (1934): *Vet. Rec.*, **14**, 332.

PREPARATION OF SUGAR MEDIA—RAPID METHOD.

By Z. MORCOS, F.R.C.V.S., M.V.Sc., D.V.H.,
Professor of Bacteriology, The Veterinary College, Cairo.

Introduction.

The following authors reported:

(1) Bigger.—Peptone water is preferred to broth (unless the broth is free of all sugars). Sterilisation is effected by the intermittent method; thirty minutes on each of three days. A solid medium (agar) containing the carbohydrate and an indicator is preferred to liquid medium. The tubes are inoculated when the medium is fluid and is then allowed to set.

(2) Zinseer.—Media containing sugars must be sterilised by the fractional method, twenty minutes in steamer on each of three successive days.

(3) Park and Williams.—Many of the carbohydrates are susceptible to heat and split up into simpler compounds. Certain sugars, especially some samples of maltose, are so easily split by heat that they must be sterilised by filtration. Inulin is an exception because of the resistant spores sterilised in the autoclave.

(4) Mackie and McCartney.—The peptone water (with the indicator) is sterilised by autoclaving. The sugars are made up separately in 10 per cent. solutions in distilled water, which are sterilised in the steamer or by filtration. The requisite amount of sugar solution is added to the peptone water. The medium is tubed and steamed for twenty minutes in three successive days.

(5) Flides, McIntosh and Murray.—(1) Take 200 c.c. peptone water at pH 7.4. (2) Dissolve in it two grams of the fermentable substance. (In all cases it is preferred by some to autoclave strong solutions of sugars and add the necessary amount in bulk after sterilisation of the base, with subsequent aseptic distribution at four following days. This is usually essential with inulin owing to the presence of resistant spores; or stock solutions may be filtered and stored in bottles fitted with burettes). (3) Add indicator to a good colour. (4) Tube with a Durham gas tube. (5) Boil in a water bath for five minutes to drive the air out of Durham tubes. (6) Sterilise by steaming.

(6) Muir and Ritchie.—Sterilisation temperature should not be at a temperature above 100° C. If the sugar in solid form be added to bouillon and this is then sterilised, there is danger that chemical changes may take place in the sugar

in consequence of its being heated in presence of a substance (such as alkalies), which may act deleteriously upon it.

(7) Kelser.—Fractional sterilisation gives good results, but is not absolutely reliable. The best procedure is to sterilise fermentable media by Berkfeld filtration.

(8) Bruce and Dilling.—Chloroform is freely soluble in alcohol, ether, olive oil and turpentine, and 1 : 200 of water, in which it sinks in heavy drops. Specific gravity 1.483 to 1.487. Does not boil below 60° C. Added to shed blood it is hæmolytic, removing the pigment from the red cells.

(9) "The British Pharmacopœia," 1914.—Water which has been shaken for five minutes with half its volume of chloroform and separated from the chloroform is neutral to litmus. Evaporated without residue.

Method.

(1) Titrated peptone water and the required indicator (1 per cent. Andrade solution is used) are filtered, distributed into flasks according to the number of sugars required and amounts needed. The flasks are autoclaved at 120° C. for fifteen minutes. (2) Solid sugar, 1 per cent., is added, and is dissolved by gentle warming of the flasks. (3) 1.5 per cent. chloroform is added and shaken well, and is left to act for fifteen minutes. (4) Sterile test tubes containing Durham tubes are one-quarter filled with the sugar solutions, using flamed or sterilised funnels, shaking gently the flasks on pouring into test tubes. (5) The test tubes containing the sugars are put in a hot bath at 50° C. for seven to ten minutes to drive out the chloroform. (6) Finally, the test tubes are put in the steamer at 100° C. for seven to ten minutes to fill Durham tubes. The sugar media are then ready for use. Media as above indicated have been found sterile, inulin included ; reactions reliably controlled by various fermentable organisms.

Discussion.

(1) Steaming sugar media for twenty minutes in three successive days has in most cases interfered with sugars and caused splitting of some, the result was change of the colour of the sugar media, and variable results in fermentation of the micro-organism under study. (2) Half per cent. agar, 1 per cent. sugar media, as indicated by Bigger, in addition to being sterilised by the fractional method, and thus exposing sugars to splitting, the gas bubbles formed soon disappear and the media soon solidify, more so in the tropics. (3) The filtration method, besides being tedious, can only be carried out in highly-equipped laboratories, and finally contamination of some of the tubes is apt to occur on pipetting, more so in the tropics.

REFERENCES.

J. W. Bigger : " Manual of Bacteriology," pages 45–46.
Hans Zinseer : " Text-book of Bacteriology," page 119.
Park and Williams : " Pathogenic Micro-organisms," page 125.
Mackie and McCartney : " An Introduction to Practical Bacteriology," page 43.
Flides, McIntosh and Murray : Medical Research Council, vol. 9, page 79.
Muir and Ritchie : " A Manual of Bacteriology," page 79.
Kelser : " Manual of Veterinary Bacteriology," page 52.
Bruce and Dilling : " Materia Medica and Therapeutics," pages 322–324.
" The British Pharmacopœia," 1914, pages 93–94.

THE SO-CALLED ELECTRICAL STUNNING OF ANIMALS.

By DR. J. ROOS,
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MR. A. WEINBERGER has given his opinion on experimental studies published by one of my collaborators and myself in this Journal, Vol. 90, No. 6, p. 232. The fact that this opinion found a place in this Journal invites to some comment. It is curious how he comes to the conclusion that our physiological experiments do not allow him "to draw any conclusions regarding the stunning of cattle to be killed, as they have not been carried out in the right manner." (p. 339). Three grounds are given :

(1) " In the first instance it may be mentioned that with swine, sheep and calves electrical stunning does not work faultlessly when alternating current is used, unless at least 500–700 milliamperes with 70 volts pass through the brain or through the prolonged spinal marrow for ten to fifteen seconds " (p. 338). And on p. 339 he repeats : " the experiments must be carried out in such a manner that at least 500–700 milliamperes pass through the animal." This agrees completely with our experiments performed on the pig and the calf. In Fig. 3 of our paper, p. 236, a graph was given of one of the pigs submitted to the alternating current of 625 milliamperes and 70 volts during ten seconds. Also the place of the electrodes, its construction, the 20 per cent. salt solution used, etc., agree completely with the author's wishes. It was intended to get an insight into the physiological phenomena caused by the alternating current, and it was therefore preferred not to limit the experiments to currents of this strength. The latter was varied in different ways, and different species of animals were used, as described in our paper. This, however, does not alter in any way the fact that the action of currents of 500–700 milliamperes, and even of stronger ones, was also studied ; this happened in the pig and in the calf, and the results of these experiments are also given in our paper.

(2) " Dogs and cats are the worst animals to be experimented upon for stunning purposes. With a dog the passage of current with a tension of 60–70 volts would amount to at least 700–1,000 milliamperes if the tongs are dipped into 20 per cent. salt water, as is done with normal stunning at the slaughter house, for the dog's head is proportionally small, as is also the resistance " (p. 339). On page 234 of our paper, however, Mr. Weinberger could read : "The cat, the dog, the rabbit, the pig, young goats, and the calf were used in the experiments." So there is no reason for any complaint relative to the choice of the animals. Those which he finds very apt have been used too. And as to the properties of the current, we mentioned in our paper : (*a*) That not only currents of 60–70 volts tension have been used. On page 234 the reader finds : " Currents of 60 or 70 volts were commonly chosen ; in small animals currents of 50 volts were sometimes used " ; (*b*) that not " currents to at least 700–1,000 milliamperes " passed these small animals." On the same page (234) the reader finds : " a micro-

amperimeter and a variable resistance placed in the secondary circuit enabled us to read and to vary the strength of the current. Currents from 2 up to 700 milliamperes and more were used, as was shown on pp. 236–237, and in Figs. 5 and 6. In my opinion Mr. Weinberger's criticism on this point has as little relation to our work as was the case on the first point.

(3) The third objection is found on p. 339; Mr. Weinberger was "horrified to see that before making the electrical stunning experiments, Professor Roos and Mr. Koopmans narcotised the animals by chemical means. The entire effect of the electrical stunning was, of course, destroyed thereby, and only signs of irritation could be noticed." This is contrary to the facts when it is suggested that we limited our experiments to animals which were narcotised before. There will be none, I think, who ever could have read this in our paper. By far the greater part of the experiments have been carried out on normal animals, and all the eight figures in our paper are obtained from normal animals, a fact which cannot have escaped notice. It is on the seventh page of our paper (p. 238) that experiments on narcotised animals and thalamus cats are mentioned for the first time. Besides this, the last line of our summary (p. 245) says clearly: "Normal and narcotised animals were used." Every explanation is redundant here. None of the objections given by Mr. Weinberger has really to do with our work.

In the rest of his paper Mr. Weinberger tells of the action of the electrical alternating current on the animal. This appears quite a simple thing to Mr. Weinberger; but he is not a physiologist, neither is he a veterinary surgeon, a medical man, nor even a biologist. His opinion on this veterinary-physiological problem could therefore be left and be forgiven him. By the fact, however, that one of the prominent veterinary journals published this physiological anomaly it is advisable to take notice of it.

"The current produces in the brain a very strong anæmia, which is demonstrated best in the stunning of poultry, which immediately get a lighter coloured comb, although this recovers its red colour if the birds are allowed to regain consciousness" (p. 338). It is a pity that the comb of the fowl is not quite the same thing as the brain of the mammal. If this were the case, one might even be able to distinguish men by their brain.

As will be known to the readers of this journal, the comb of the fowl contains blood vessels whose condition is determined by the vasomotor nerves. By the fact that these vessels come into contraction it is proved that excitation of the vasomotors by the alternating current is produced in the bird as well as in the mammal. But in the brain of mammals the effect of vasoconstriction is quite different to what takes place in the body, and anæmia is not produced here. This difference between the brain and other organs is of great importance.

Bayliss,[1] who investigated the vasomotor system, writes: "A generalised vasoconstriction raises the aortic pressure and affords a better supply of blood to organs whose arterioles are not narrowed, because they are poorly, or not at all, supplied with vasoconstrictor nerves, such as the coronary vessels of the heart

and the vessels of the brain." The same result was obtained by Bayliss and Leonard Hill,[2] who concluded from their experiments: "No evidence has been found of the existence of cerebral vasomotor nerves. . . . In every experimental condition we find that the cerebral circulation passively follows the changes in the general arterial and venous pressures." Roy and Sherrington[4] and other investigators could be added. Consequently the quantity of blood which passes through the brain is not diminished by a general vasoconstriction. That this is really the case in the animals submitted to the alternating current was demonstrated in experiments performed on the pig, the goat, dog and cat.[3] They confirmed the conclusion of Bayliss and L. Hill, and others, that a rise of arterial pressure increases the quantity of blood passing through the brain.

What remains in Mr. Weinberger's paper is the assurance that "the electrical stunning is a method of stunning to which no objection can be made" (p. 338, last paragraph). This is, indeed, a most simple conception. "In a fraction of a second the animals are unconscious" (page 338). If this is only accepted, everything should be right, and no uneasiness should be produced among the public. In fact there seems really to be no problem at all. And after Mr. Weinberger's highly modest opinion there is plenty of reason for accepting his conclusion without more ado. "After having made all fundamental tests, and also since I have carried out electrical stunning myself with several thousands of cattle, I think I may consider myself entitled to give an opinion on the electrical stunning of animals for slaughter" (p. 338).

Indeed, everyone is free to have an opinion; but such an opinion is without any value if it is not properly supported, or incompatible with facts and views generally accepted in science. It consequently is of no value for the veterinary surgeon.

To Mr. Weinberger the "fundamental test" is quite a simple thing. "Any doubters of the electrical stunning should visit slaughter-houses where an electrical stunning plant has been installed, and they will at once realise the humane slaughtering method" (p. 340). "Such assertions [as given by our experiments] only produce uneasiness among the public" (p. 340). Professor Roos and Mr. Koopmans give a wrong idea of the electrical stunning of animals to be slaughtered, "for this method is being used to-day at over one thousand places with great success" (p. 337).

The intrinsic condition of the animals themselves, which is the only problem by which the non-layman is able to discuss the question of the consciousness of the animals, is not his problem. Nor need it be so. It is the problem for the veterinary surgeon, who has to choose between the methods himself, and who should have at his disposal all data collected by laboratory and practice and, lastly but not least, a free judgment.

Finally, I am compelled to go against assertions not only in defiance of truth, but unseemly and unworthy. I would not have troubled to do so were it not that they had been placed in this Journal.

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(1) "Mr. Weinberger offered to place all testing apparatus at his [*e.g.* my] disposal free of charge so as to enable him to determine border-values. He declined this offer however " (the end of p. 338).

The facts are thus: Mr. van der Slooten, Director of the Public Slaughter-house of Utrecht, and lecturer on Meat-Inspection of the University, was requested by Mr. W. to accept an " electrolethaler " apparatus for using in his abattoir, in order that he might convince himself of the efficacy of the apparatus. Mr. van der Slooten did not find such an experiment useful, as he thought it impossible that a simple observation of the animals submitted to the current of the apparatus could in any way contribute to the primary question, *i.e.*, the condition of the consciousness of the animals. Furthermore, the papers on the subject found in literature had not discussed this question in a way that could satisfy him. Nor had the fact that many apparatuses are used in many slaughter-houses, and that thousands and thousands of pigs are treated by the current, made a definite impression on him. Mr. van der Slooten therefore called in the aid of the laboratory. We were immediately willing to help him, but under the explicit condition that the laboratory would have to do only with Mr. van der Slooten and with nobody else. We preferred to remain fully free and independent, and we did not like to have any connection with the merchant or the promotor of the apparatus—Mr. Weinberger.

Mr. van der Slooten accepted our conditions fully, informed Mr. Weinberger especially of the fact that the researches would be made in our laboratory, added that in Holland a Jewish professor is as credible as any other, and the agreement was made between Mr. van der Slooten and Mr. Weinberger.

Afterwards, in May, 1932, sixteen pigs had been submitted to the current in the abattoir of Utrecht, exactly in the way as prescribed by Mr. Weinberger to Mr. v. d. Slooten, in the presence of Mr. v. d. Slooten and myself; and after some facts had been established here, which will not be discussed now, the laboratory received the apparatus from Mr. van der Slooten.

After a year had passed I received quite unexpectedly a letter from Mr. Weinberger saying: "We have known for a long time past that you have been asked to give a report on the electrical stunning. We are of the opinion, however, that you have not the right apparatus in order to investigate electrical stunning correctly. It is on this ground that we offer to put at your disposal the apparatus finally necessary."*

This letter was forwarded to Mr. v. d. Slooten. We both were astonished by the information that the apparatus offered to Mr. v. d. Slooten in order to stun pigs was not the right apparatus, as soon as it was wanted to investigate the electrical stunning for which the apparatus was sold. The next was answered:

" You must remember that the apparatus used in our experiments is the same apparatus you put at Mr. van der Slooten's disposal last year after you knew from the conference and from the correspondence with Mr. v. d. Slooten

* This piece of the letter and the following extracts are translated literally from German.

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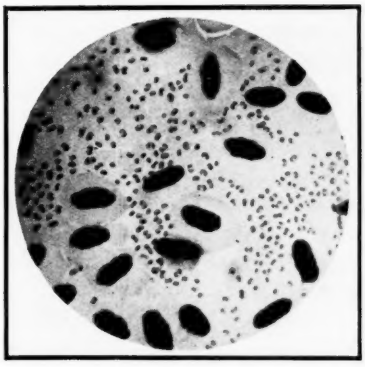

Experimental Case.
Blood film from pigeon inoculated with culture. *Leishman.* — × 1,000.

Blood film from fowl. Natural case, showing bipolar staining of the organism (*P. avi-septica*). *Giemsa.* — × 1,200.

(*Article by* J. E. Wilson and D. R. Wilson, *page* 57)

By courtesy of ***Farming.***

Rupture of the Serratus Magnus in a Jersey Heifer.

(*Article by* A. W. Waters, M.R.C.V.S., and A. W. Peyton, *page* 81).

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(in every case you could know it) that the director, v. d. Slooten, had called in my aid before in order to investigate the question whether pigs could be stunned and rendered insensible *with this apparatus* (as you gave it to Mr. v. d. Slooten) when used according to your instructions. Consequently I am extraordinarily astonished to hear from you a year afterwards that I have not the right apparatus *for this investigation.* In other words, that the apparatus supplied by you is not able to stun effectively.

" I therefore should like to know what is wanting in the apparatus in order that it may function well. It will depend on your answer whether I shall accept or not your offer to put at my disposal the apparatus wanted."

Now the next surprising answer was received: " In answer to your letter . . . we inform you that with the apparatus given to the director of the abattoir of Utrecht, you are quite able to stun pigs faultlessly, but you have no apparatus to stun *great animals* (*Grossvieh*), which would be of great interest, especially for the Jews (*Israeliten*). Nor have you an apparatus for stunning fowls."

Neither Mr. van der Slooten nor myself being interested in experiments on these animals at the moment, new apparatus was not wanted, and Mr. Weinberger's letter was not answered.

These are the facts violated by Mr. Weinberger, when he said: " We offered to place all testing apparatus at his disposal free of charge so as to enable him to determine border-values. He declined this offer however " (p. 338).

(2) On page 340, Mr. Weinberger writes: "For the rest, Professor Roos is said to have worked out an opinion for the rabbits in Germany which differs considerably from the former ones." It will do, I think, to say here that neither I nor any of my assistants ever gave an opinion on the so-called electric stunning differing in any way from that given in our paper in this Journal, either verbally or on paper. For the rest, there is no reason why one should not be allowed to give an opinion, even if it were for rabbits in Germany. One cannot allow, however, the insinuation " it is said," so that it can neither be verified nor combated by a reader.

(3) The reader will excuse me when I finish the discussion by this conclusion: If it should happen that a reader is not fully convinced by the paper given here, he will be convinced immediately, and amazed at the same time, by reading Mr. Weinberger's paper on the same subject in the *Deutsche Schlachthofzeitung* of December 10th, 1934 (34e Jg., p. 319). I wish to emphasise the fact that this paper appeared some months after the paper discussed was accepted by the Editor of this Journal, and consequently could not influence his attitude.

REFERENCES.

[1] Sir William M. Bayliss: "The Vasomotor System." London, 1923: Longmans, Green & Co.
[2] Sir W. M. Bayliss and Sir Leonard Hill: *Journal of Physiology*, **18**, 1935, 334.
[3] J. Roos and S. Koopmans: *Tijdschrift voor Diergeneeskunde*, **60**, 1933, 1307.
[4] C. S. Roy and C. S. Sherrington: *Journal of Physiology*, **11**, 1890, 85.

LOUPING-ILL, BRAXY AND LAMB DYSENTERY.

By J. RUSSELL GREIG, Ph.D., M.R.C.V.S.

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BRAXY has been recognised and recorded in Britain for over a century. The disease occurs in certain well-defined districts, especially the western seaboard of Scotland, Wales and Ireland, and in the hilly country of the eastern borders of Scotland and England. There is now reason to believe that different forms of braxy occur in different parts of the country, but so far as Scotland is concerned, the name " braxy " appears to be represented by a definite disease entity, which is identical with the braxy, or " bradsot " as it is called, of Denmark, Iceland and Norway.

A Well-Defined Incidence.

Braxy has a rather well-defined seasonal incidence. It principally occurs in the autumn and early winter, and young sheep at the hogg stage are much more susceptible than at any other period of their lives. It is well recognised that if sheep at this age are removed from braxy pastures, they are much less likely to fall victims to the disease. For this, among other reasons, hoggs at the back end of the year are frequently transferred to low-lying pastures, or are "wintered away," as it is called.

A remarkable feature of braxy coinsists in its relation to certain climatic conditions; low night temperatures associated with a considerable degree of humidity in the atmosphere, that is to say, conditions productive of hoar frost, appear to render sheep particularly susceptible to attack.

The disease in Scotland is characterised by a very short period of illness; indeed, it is usual that no symptoms of illness are observed in the affected sheep; they are simply found dead. The carcase undergoes a very rapid decomposition, but if it is examined immediately after death, a patch of inflammation will almost invariably be found on the lining membrane of the abomasum or fourth stomach. That is certainly the most characteristic change observable on post-mortem examination.

My predecessor in office, the late Professor Gaiger, found that a particular microbe, known as the *Clostridium septique*, was constantly associated with the disease. We are still without definite information in regard to the actual conditions which permit of this microbe exerting its mischievous effects, but there is no doubt that it is the immediate cause of braxy.

The next step in the research consisted in devising methods by which sheep could be rendered immune to the specific microbe, and various types of vaccines were prepared. The results of the earlier attempts at vaccination were irregular, but since 1932, as a result of improved methods of preparation, a vaccine has been devised which is capable of reducing the mortality to less than 1 per cent. When it is stated that on many farms there occurred braxy mortality rates varying

from 5 per cent. to 25 per cent., it will be realised that braxy vaccination has effected a very large saving to the flockmaster.

Methods of Vaccination.

Until recently the method consisted in two injections of vaccine at an interval of fourteen days prior to the commencement of the braxy season. This, of course, entailed very considerable labour in so far that the hoggs had to be gathered twice. During the last two seasons we have conducted field experiments to determine whether a single dose of vaccine would afford adequate protection. The results of these experiments have shown that this in fact is so; that a single dose affords an adequate immunity, except, perhaps, in flocks in which the braxy mortality is exceptionally high.

So much for braxy proper as it occurs in Scotland; but, as I have already indicated, the name " braxy," especially in England and Wales, has been applied not to one disease, but to what will probably prove to be a group of different diseases, all of which are characterised by a remarkably short period of illness and a high mortality. At present, for the sake of convenience, we use the term " braxy-like diseases " with reference to these conditions, and the Agricultural Research Council has set up a Braxy Committee for the purpose of defining these separate conditions and of investigating their cause and nature. At present a comprehensive scheme of research is in process of being drawn up. The scheme will be operated through veterinary research centres, veterinary advisory officers and veterinary practitioners; but it is part of the purpose of the scheme to interest farmers in braxy-like diseases, because it is felt that much valuable information can be provided by the flockmaster himself; and I take this opportunity of appealing to farmers, not only in Scotland, but also in England and Wales, whose flocks suffer from braxy-like diseases, to communicate in the first instance with the Secretary of the Braxy Committee, Mr. A. D. M'Ewen, the Agricultural College, Wye, Ashford, Kent.

Lamb Dysentery.

And now let us consider the position in regard to lamb dysentery. This disease had been recognised in certain farms on the Borders for many years, but during the years of the War it appeared to increase markedly in virulence, and made rapid extensions over a wide area; indeed, some twelve or fourteen years ago it threatened to become a veritable menace to flockmasters, and upon occasion it caused a mortality of 50 per cent. of the lamb crop. This was one of the first investigations carried out by the Animal Diseases Research Association, and after very laborious researches, a specific microbe was definitely shown to be the cause of the disease.

As is well known, lamb dysentery affects only very young lambs, and infection probably always occurs during the first three days after birth. The attack in the acute form is sudden; the lamb is found to be dull, lags behind the flock and shows little or no inclination to suck; diarrhœa very soon makes its appearance; the excrement is at first yellowish and liquid, but usually soon becomes brownish

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in colour, and may actually contain blood; death results in the course of a day or two. It has now been recognised that a chronic type exists which affects lambs as old as fourteen to twenty-one days. The symptoms are similar to those of the acute type, but are less intense in character.

On examining the carcase, inflammation may be found to extend throughout the whole intestine, which is also the site of marked ulceration. The contents are usually fluid, but, upon occasion, may consist of unaltered blood.

There are two means of protecting lambs against this scourge: one consists in vaccinating the ewe just before the tups are put out, and again about ten days before the lambing season is due to commence. Now it is a remarkable fact that while this method does not give the newly-born lamb any immunity, it brings about the development of antibodies and antitoxins in the milk of the ewe, in which they are highly concentrated, and the lamb receives its immunity with the first suck of its mother's milk. The other method consists in injecting the lamb with an immune serum as soon after birth as is practicable.

Serum Injection.

Both of these methods have proved of the highest value in the protection of lambs from the disease. Of the two methods, the second, *i.e.*, the injection of the lamb with serum, is, if anything, the more effective, and it has been our almost invariable experience that by this means the losses can be reduced to ***nil.*** On the other hand, on hill farms especially, it is frequently found very difficult to inject with serum all the lambs within an hour or two of birth, and in such cases the flockmaster may find the vaccination of the ewe the more suitable method to adopt. It is very difficult to estimate the saving to agriculture which this research has effected, because had there been no means of controlling the disease it would in all probability have become widespread, and areas in which lamb dysentery has not yet appeared would now be suffering from its ravages; but if we were to say that these preventive methods are resulting in a saving to British agriculture of £100,000 sterling per annum, I do not think that that would be putting the figure too high.

Louping-Ill.

The disease of sheep known as "louping-ill" has been recognised from time immemorial as occurring in certain well-defined areas in Scotland. It was early observed that the disease occurred only on tick-infected pastures; and since its seasonal occurrences in April, May and early June, and again in September, coincided with the periods of maximum tick activity, there was considerable circumstantial evidence that the tick was the carrier of the disease.

During the last forty years louping-ill has been the subject of much investigation, but some five or six years ago the Association's researches showed that the infective agent was present in the central nervous system of affected sheep, and that it was, in fact, an ultra-microscopic filtrable virus. That is to say, the cause of louping-ill is so small that it cannot be seen by means of the most powerful

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microscope, and, indeed, so small that it is capable of being filtered through unglazed porcelain.

Experimental Results.

Once we were able to reproduce the disease experimentally experiments designed to determine whether the tick was in fact able to transmit the disease from affected to non-affected sheep could be carried out under precise conditions, and it was soon found that the tick was capable of transmitting the disease from sheep to sheep, and there is every reason to believe that this represents the usual method of transmission under field conditions. It was soon proved that when sheep were inoculated with the living virus they passed through a mild attack of the disease, and were subsequently solidly immune to louping-ill. Unfortunately, however, one can never be sure that the inoculation of living virus will result in only a mild attack of the disease. In short, it became evident that a safe and protective vaccine could be produced only from the dead virus. Dead vaccines were accordingly prepared, and during the last four years these have been extensively tested by controlled field experiments in which many thousands of sheep have been employed. We are now satisfied that louping-ill vaccination is capable of reducing the mortality from this disease to a very low figure.

At present the production of the vaccine is a very costly procedure, but it is hoped that means will be devised by which the cost of production will be very considerably reduced, for there is every likelihood that by means of vaccination the disease will be effectively controlled. During our researches into louping-ill it became evident that there existed a hitherto unrecognised tick-borne disease of sheep: this we have provisionally named "tick-borne fever." Tick-borne fever has long been confused with louping-ill, but it has now been shown to be distinct from that disease, and its causal organism has been demonstrated. It is widespread throughout Scotland, and occurs practically wherever ticks are found. The mortality from this disease would appear to be comparatively low, but it causes a serious reduction in the sheep's physical condition and renders it susceptible to other diseases such as louping-ill.

Specified Method of Prevention.

Work is proceeding upon this problem with the ultimate object of obtaining a specific method of prevention. As is well recognised, when sheep are introduced to certain hill areas they suffer a serious loss in physical condition, and this is very frequently associated with a high mortality. After some time the survivors improve in condition, and the mortality incidence approaches to that of the native stock. These sheep are then said to have become "acclimatised." Apart from the need for newly-introduced stock to learn their "hefts" on the hill, the factors involved in the process of acclimatisation are largely represented by immunity to louping-ill and to tick-borne fever, acquired as a result of exposure to these diseases. At present the introduction of large numbers of sheep, *e.g.*, ewe lambs, to such pastures would be followed by disastrous losses. It is, of course, necessary that rams for breeding purposes be repeatedly introduced to

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such pastures, and the death-rate in rams so introduced is such that it is a common practice among hill farmers to take delivery of purchased rams very shortly before the commencement of the breeding season, *i.e.*, after the autumnal season of tick activity has passed.

There is reason to believe that if means could be obtained for the artificial immunisation of sheep against louping-ill and tick-borne fever, or, alternatively, if the tick could be controlled, the method of sheep husbandry which obtains throughout large hill areas in Scotland could be changed, free movement of sheep could be practised with impunity, and the value of hill flocks would be markedly raised.

USE OF THE STOMACH TUBE IN DOG AND CAT PRACTICE.

By J. GILBERT HORNING

Houston, Texas.

Anatomy and Physiology of Œsophagus, Stomach and Duodenum: Gastric Function.

It is my opinion that anatomy and physiology should be taught as inter-related subjects, with reference to their subsequent clinical application. The study should largely be of the living animal rather than of the dissecting subject. This should be far more interesting to the student and lead to create a better knowledge for use in clinical work.

The Œsophagus.

The œsophagus connects the pharynx to the stomach, and is a rather wide, easily dilatable muscular tube, which spreads in an extensive design in the cervical and thoracic regions. It bends from the left side of the trachea to the entrance of the chest, and takes up again its middle position. In the thoracic cavity it is crossed on the left by the posterior aorta, and itself crosses on the right the left bronchus (*see* Figs. 4 and 5).

Four strictures occur in the œsophagus due to the compression related organs exercise upon it. From front to the back one finds a cricoidian stricture (isthmus œsophagi) situated at the beginning of the œsophagus back of the cricoid; an aortic stricture at the point where the posterior aorta crosses the œsophagus; a bronchial stricture due to the compression by the left bronchus, and finally a diaphragmatic stricture at the point where the œsophagus passes through the diaphragm.

The alimentary bolus is discharged by the pharynx and received by the œsophagus and pushed, by contraction of its muscular fibres in rhythmic waves, into the stomach.

The stoppage of foreign bodies in the œsophagus occurs most frequently in the

superior and inferior sphincter regions. When it occurs in the middle portion, it is generally at the crossing of the posterior aorta.

The Structural Character of the Œsophagus is similar to that of the pharynx, and consists from within outward of the following coats or tissue layers: (1) The mucosa, which has a surface epithelium and underlying stroma or tunica propria; a narrow muscular band, the muscularis mucosa, separates this from the submucosa. (2) The submucosa, a strong, loosely arranged fibrous and elastic tissue coat that forms an excellent pliable layer for the mucous glands and lymphatics, and for nerves and blood vessels to spread in before they branch off to supply the mucosa. (3) The muscular coats consist of two layers of spiral (striated) fibres which cross each other and make up the entire musculature of the œsophagus to near the cardia, where they become longitudinal and circular (smooth) fibres continuous with those of the stomach. (4) The fibrous coat serves to connect the œsophagus with the surrounding parts, and is composed of white fibrous tissue and elastic fibres.

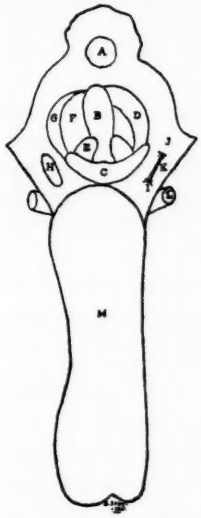

FIG. 1.—Dorsal aspect of tongue, larynx and œsophagus. A, lumen of the œsophagus cut off just as it opens into the pharynx; B, the glottis; C, epiglottis; D, crico-epiglottic ligament; E, true vocal cords; F, false vocal cords; G, arytenoid cartilage; H, tonsil exposed; I, anterior pillar of the fauces; J, posterior pillar of the fauces; K, tonsillar groove, closed; L, hyoid bone cut off; M, tongue.

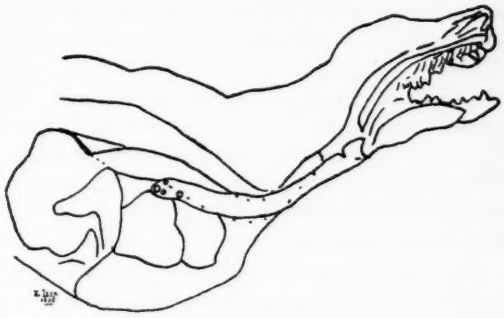

FIG. 2.—Sagittal section, median line, left half of dog, exposing the tongue, larynx, pharynx, œsophagus, stomach, trachea, bronchus and lobes of the lungs.

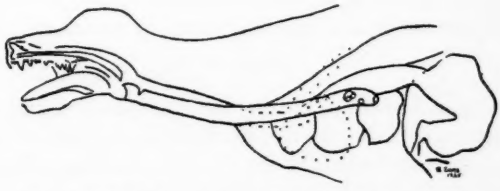

FIG. 3.—Sagittal section, median line, right half of dog. The marking — . — . shows the œsophagus turning down under and slightly to the side of the trachea. The marking . . . . . shows the position of the heart and its relation to the parts involved.

Nerves.—The upper part of the œsophagus, composed of striated muscles, is controlled by the vagus; the lower part, composed of smooth muscle fibres, contains throughout an intrinsic ganglionated plexus, and in this respect resembles the walls of the stomach and intestines. This system of enervation gives it the power of autonomic activity. The lower part is affected by hunger stimuli also, and has hunger contractions the same as the stomach, especially when the contractions of the latter are at their height. Insensitive to tactile stimulation and mineral acids, the œsophagus is extremely sensitive to thermic stimuli, which are conveyed to the central nervous system by the vagus and not by the sympathetic nerves.

The Blood Supply.—Arterial blood reaches the œsophagus from the left common carotid, from the gastric and the œsophageal branches of the thoracic aorta, and from the broncho-œsophageal, which is also a branch of this artery. The œsophageal veins pour their blood into the systemic circulation through the azygos veins, and form an anastomosis also with the gastric veins, which empty into the portal system.

The Function of the Œsophagus is to convey food from the pharynx to the stomach. As the passage of the food bolus is discharged into the œsophagus there is a sensory nerve impulse directed to the high nerve centre which creates as an efferent reflex a succession of peristaltic contractions that move the bolus on to the lower part, where there is a further contraction of the œsophagus that has been anticipated by a relaxation of the cardia, permitting instant reception by the stomach. The periodic relaxation of the cardia allows repeated regurgitation of the stomach contents into the lower reaches of the œsophagus and even higher, but this is quickly returned by peristaltic waves.

The Stomach.

The stomach of the dog and cat is divided into two compartments by a well-defined sphincter development called the " incisura angularius." The left cardiac compartment used for the reception and digestion of food is called the " saccus digestorius," and the right pyloric compartment acting as the motor or ejaculatory portion is termed the " canalis egustorius."

The "saccus digestorius" is large and rounded, and consists of a left extremity or fundus that is usually filled with air (the "magenblasse"); this goes to a descending ventricle composing the main body of the organ, termed the " tubus gastricus " or " corpus ventriculi." The " canalis egustorius " is small and cylindrical, composed mainly of a vestibule, this merging imperceptibly into a channel, which develops into a muscular band, the pylorus.

When the stomach is empty or partly empty it is separated from the ventral abdominal wall by the liver and intestines; when full or nearly full it is indented on its greater curvature by the adjoining viscera, transverse colon, the left kidney and spleen; forward it comes in contact with the left leaf of the diaphragm and the liver. When full it reaches a relatively large size. Like the œsophagus, the

stomach has four layers: The mucous layer lines the stomach and varies in thickness, being thinner at the cardiac end, increasing in thickness towards the pylorus. When the stomach is empty the mucous layer is thrown into many folds or rugæ that disappear as the stomach becomes distended. The membrane is composed of tightly packed glands: in the upper fundus they are straight and tubular, in the pyloric portions they are elongated, and in some cases bifurcated, penetrating

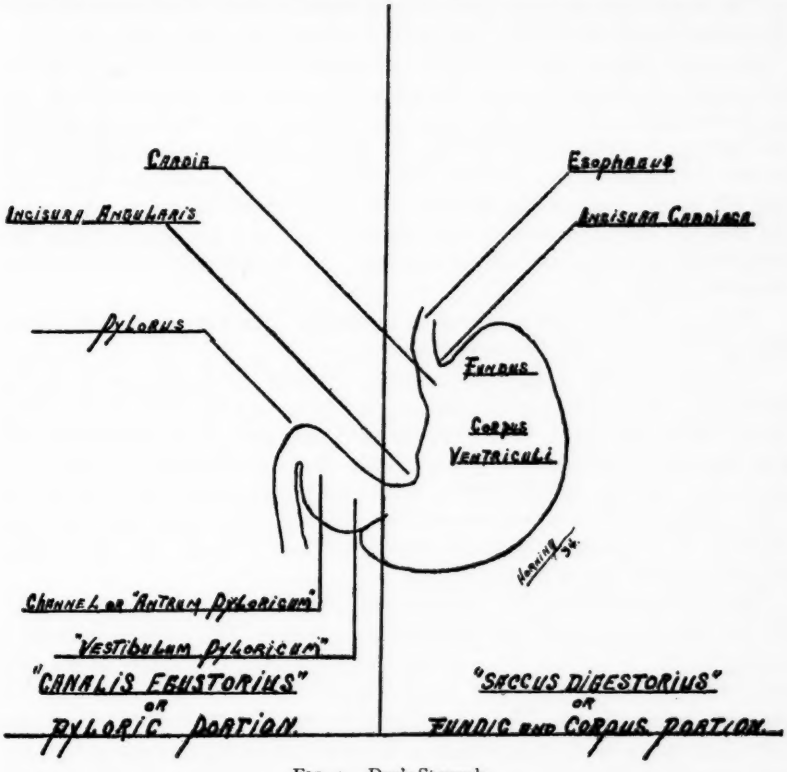

FIG. 4.—Dog's Stomach.

to the submucosa. The membrane propria bears the blood vessels to the secreting surface and separates the glands. Mucous glands similar to those of the lower œsophagus surround the cardiac entrance.

The submucosa forms a layer for the distribution of blood vessels and nerves before they enter the mucosa.

The muscular layer is composed of longitudinal muscular fibres that are continuous with those of the œsophagus and run uninterruptedly through the pyloric portion, being chiefly along the curvatures, and when reaching the pyloric

part become heavier and thicker. The circular fibres are more massed in the antrum and pyloric areas, mainly creating the sphincter arrangement of the pylorus. The oblique or innermost layer of the muscle fibres in the fundus and body of the organ create a food channel, the "magenstrasse" of Retzius, along which food may travel without intermixing with the general contents of the stomach; the oblique muscles also create the cardiac sphincter.

The serous layer is the covering formed from the peritoneal coat, and leaves the stomach along the curvatures to form the lesser and greater omentum.

The Blood Supply (Arterial).—The right gastric, which anastomoses with the left gastric after passing along the lesser curvature, and is continued by the gastro-duodenal. This divides near the pylorus into right gastro-epiploic, and supplies branches to the pyloric part of the stomach, and passes along the greater curvature in the omentum anastamosing with the left gastro-epiploic. The left gastric passes along the lesser curvature, ramifying on the left part of the stomach and anastamosing with the right gastric. The gastro-splenic also supplies the left extremity of the stomach. All these branches originate from the cœliac artery axis.

Veins.—All the veins of the stomach empty into the portal vein, either through the mesenteric or gastro-splenic veins.

Lymphatics.—The small lymphatics in the mucous layer converge in the submucosa, penetrate the muscular coat, and appear on the serous layer. They usually follow the venous flow. The glands of the portal group are credited with full drainage of the area. It is my opinion that the lymphatic system of the stomach of the dog and cat could stand further investigation; as I feel sure the entire drainage of this organ does not rest with this group alone, and that there could be a grouping of the glands mentioned, and drainage into other lymph glands or group of lymph glands noted.

Nervous System.—The nerve supply is from the involuntary system, composed of the parasympathetic and sympathetic systems. The parasympathetic is formed by the vagus in a union of the dorsal and ventral divisions of the right and left vagus, concurring with the cœliac plexus in forming the posterior and anterior gastric plexus. The sympathetic system is formed from the greater splanchnic nerve, which terminates into the semilunar ganglia; branches from this form the cœliac plexus that gives off branches to the surfaces of the stomach. In addition to the external nerve supply the stomach has an internal set of nerve fibres formed in the muscular coat and in the submucosa which are connected with the terminals of both the parasympathetic and sympathetic fibres. They retain peristalsis in the absence of the external nerve control. The nerve supply in the muscular coat is called Auerbach's plexus, while that in the submucosa is known as Meissner's plexus.

The duodenum is so closely related to the stomach that it is of vital importance to those studying this organ. From the pylorus the duodenum passes posteriorly along the visceral surface of the liver, coming in contact with the right flank,

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going along the right side; at the pelvis it makes a U turn, passing along the medial side of the colon and left kidney, bending outward (ventrally) it joins the jejunum (the upper part of the small intestines) at the left root of the mesentery. Two or three inches (5 to 8 cm.) from the pylorus the bile and smaller pancreatic ducts open into the duodenum, and about one or two inches (2.5 to 5 cm.) back of this the larger pancreatic duct enters the duodenum.

The first portion of the duodenum is a continuation of the stomach. Its mucous membrane is similar to that of the whole intestinal tract with the numerous

FIG. 5.—Pavlov Pouch.

villi that increase the absorbability of the intestinal surface. The mucosa is lined with tubular glands called "crypts of Lieberkuhn," which empty at the base and between the villi. The glands of Brunner are small acinotubular glands resembling the pyloric glands of the stomach; they lie in the submucosa, and empty on the surface of the mucosa. Peyer's patches or glands are solitary glands of the intestines, minute nodules of lymphoid tissue projecting from the mucous membrane, about twenty being in the duodenum of young dogs. The arterial supply is from the superior and inferior pancreatico-duodenal arteries, and the venous supply from the superior mesenteric vein above and below empties directly into the portal vein. The lymphatics drain into the series of nodes about the head of the pancreas, and the nerve supply is derived from the splanchnic and vagus trunks. Histologically there are records of study of the gastric secretion on animals as early as the later part of the eighteenth century. However, it remained for Pavlov and co-workers (1897) to succeed in creating in a dog an isolated sac of the fundus portion of the stomach with its nerve supply intact, and an opening provided directly through the abdominal wall. On feeding the dog they were able to study the pure gastric juice secretion, that had been mixed

with food, from the lesser sac. The Pavlov pouch is still used in research work to-day. The physiologists have obtained much data and established certain facts that are of great importance to the veterinarian.

Pure gastric juice in the dog is as colourless as clear water, it is odourless, acid in reaction, slightly salty to taste, and to a certain degree mucilagenous. Pure gastric juice will keep for months, and is bacteria free, but has no bactericidal action. It is the only secretion in the body containing free acid which is hydrochloric, the concentration varying between 4 and 5 per cent. (Pavlov); the acid is secreted by the cells of the fundus glands. Traces of lactic acid are regularly found in fasting dogs (Coutejean). The specific gravity of the gastric juice is 1001 to 1004. The two main enzymes are rennin and pepsin; pepsin dissolves proteins in the presence of acid to peptones and albumoses. Rennin coagulates milk in the presence of calcium in a slightly acid or slightly alkaline medium. Raw milk gives a firm hard curd with the separation of a clear yellow liquid called whey. Boiled milk or cream gives a finer, softer curd (Rhefus). Lipase or steapsin is a fat-splitting enzyme.

The greater part of the gastric juice, over 80 per cent., is secreted by the fundus and corpus ventriculi portion of the stomach, this containing free acid and the enzymes or ferments. The pyloric portion secretes a heavy mucilagenous secretion, alkaline in reaction, and, according to Ivy and Oyama, this contains no digestive ferments. Heidenhein believed that mucus was alkaline. Pavlov suggested that it was the mucus which lowered the free acidity of the stomach by neutralisation. Ivy made pouches of the pyloric antrum in dogs, and found the secretion of these pouches to be "mucoid, viscous, tenacious, transparent, odourless, and slightly salty. It resembled egg-white in appearance and consistency, was slightly alkaline with a pH of 7 to 7.5, and neutral to litmus." Lim, in an exhaustive article on the relationship between gastric secretion and basal secretion of the stomach, states that "it thus seems not likely that the colloid nature of mucus accounts (absorption of alkali) for the tritable total acid found with the lowest secretory rates." He adds: "at lower secretion rates the concentration of mucus is unquestionably higher, especially in case of the entire stomach juice *containing pyloric secretion, which is continuous and little altered by secretory activity in the fundus.*" Fogelson observed "that in practically every case when free acid was low and excess mucus was present, and, conversely, when the free acid increased, little or no mucus was present. This observation was so consistent that a study of the rôle of mucin in gastric physiology, with especial reference to its antacid character, was started." Hence, from the observation of Fogelson, of Whitlow, and confirmed by Klug, evidence points to mucus protecting the gastric mucosa against the gastric juice, against auto-digestion of the stomach, and to its prolonging the rate of dialysis of pepsin. When Fogelson fed a dog one-half ounce of mucin mixed with a pound of meat, free acid did not appear in the dog's stomach throughout the period of observation of from five to seven hours.

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According to Pavlov, the amount of gastric juice secreted in a dog's stomach is in direct proportion to the amount of food eaten. He further demonstrated with dogs that had been œsophagotomised and had a Pavlov pouch when fed food that came out the divided œsophagus: they secreted a full strength gastric juice; even anticipation of food created this, while fear, hate and other emotions retarded it. However, when he cut the vagus nerve this psychic stimulation of the juice was not possible.

Foods in the stomach create a stimulation of gastric secretion. Pavlov introduced some water into the stomach of a dog through a Pavlov pouch, and a small amount of gastric secretion was noted. To prove that this involved a different sort of mechanism from that which stimulates the psychic secretion he severed both vagi and the cœliac plexus. He got a positive response from the introduction of raw meat. The most active secretion occurred following the introduction of meat extracts. Egg-white showed very little response, and bread alone proved a poor stimulant; however, starch, in combination with other foods, stimulates secretion, but by itself is negative. Alcohol and peptones cause increased secretion, my reason for recommending nutritive liquid peptone feeding with the tube, as it has 22 per cent. alcohol in the solution.

Ivy found that a standard meat meal to which 50 c.c. of water has been added leaves the stomach of a dog in three hours. When 400 c.c. of water is added to a standard meat meal it leaves the stomach in two and a-half hours, proving that water is a stronger stimulant when given in larger amounts.

We can prove conclusively that forced feeding is justified. The chemical properties of food within the stomach give rise to a secondary secretion of gastric juice; although psychic secretion creates a stimulation, food that does not produce this reaction is handled as readily as food that does. In forced feeding of dogs and cats one should naturally select foods most suitable to the condition of the animal. For satisfactory results the reader is referred to the list mentioned in previous articles.

Thus we have demonstrated that in normal functioning of the stomach there is a psychic phase and a chemical phase during the act of eating. That the amount of free acid becomes greater, then decreases during the inter-digestive period, in which there is little or no secretion from the fundic and corpus ventriculi portion; the inter-digestive phase being in direct ratio to the number and amount of feedings, the rest phase in adult animals being longer during the night. That the mucus secretion is practically constant. That, depending upon the state of health and temperament of the individual animal, its environment, the amount and quality of food given and the number of feedings, the gastric cycle of the stomach repeats and repeats itself, but each phase varies according to the factors presented.

Gastric Action and Control.

I have already related the action of the œsophagus, how the food bolus is swallowed and enters the pharynx, then œsophagus, the peristaltic waves carrying

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it towards the stomach, the relaxation of the cardia to receive it. The action of the cardia is like a delicate valve superbly controlled: it relaxes in advance of the reception of the food bolus and closes after its reception. The fundic portion of the stomach is partly filled with air; this volume is kept fairly constant by the escape of surplus on relaxation of the cardia before entrance of the food bolus. When the stomach is over-distended, if from food, the cardia relaxes and allows a regurgitation into the œsophagus until the pylorus empties enough from the pyloric portion to take care of the fundic and corpus overflow. When the stomach becomes very full the autonomous nerve supply permits distension of the stomach walls, and even the abdominal muscles relax to allow for the distension and assist in preserving intra-gastric pressure, permitting proper mixing of the food contents.

My reason for this assumption is based on the fact that food entering the normal stomach is of a liquid, semi-solid or solid consistency, that is mixed by the fundus and corpus with pepsin and acid, handed on to the pyloric portion for further mixing and tritrating. Should the contents be a mixed meal of proteins and carbohydrates, expulsion into the duodenum starts from two to ten minutes after being received by the stomach. As before mentioned, there is sometimes a regurgitation into the œsophagus for thirty minutes or more of the overflow; as soon as sufficient contents are discharged from the pyloric portion and the same amount as discharged is received from the corpus and fundic portion, a natural contraction of the stomach takes place. To me this seems logical. However, Cannon advances another idea that is well substantiated by his work on cats. He claims that after thirty minutes, more or less, the food is so thoroughly mixed with acid that it creates a tonus for the sphincter of the cardia, and stops regurgitation into the œsophagus.

The size and consistency of food, its time of entrance into the stomach, are all factors in the time of its discharge into the duodenum. Water alone goes directly through the gastric tube; when mixed or taken with the meal it hastens emptying time; semi-solid or solid food is handled more slowly. As it enters the stomach it is arranged along the greater curvature; then, when that is covered and more food is swallowed, it is arranged along the lesser curvature; as this fills, and more food enters the stomach, it is arranged on top of the layer already covering the greater curvature, then on top of the layer already covering the lesser curvature, etc.

Carbohydrates, when fed first, empty first; when mixed with proteins the emptying rate is retarded. Proteins, when fed first, are slower than carbohydrates; and fats, which are well left out of the diet of a dog, empty slower than proteins. The coarser the pieces of meat that are fed, the slower they leave the stomach and the more the intestines are saved from trying to do the stomach's work as well as their own.

The peristaltic waves progress over the fundus and corpus, knead and massage the food in that portion, distributing and mixing the pepsin and acid with the

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food. Starting at the cardia, the waves become deeper and deeper as they progress, until they reach the pyloric portion, where they remain about the same level; this is the first peristaltic phase of the stomach. In the second phase there is a contraction and lengthening motion of the pyloric similar to a milking rhythm, and the chyme is discharged into the duodenum in a jet, then there is relaxation. The spurting of the jets of chyme are from three to five a minute. The peristaltic waves, the effect of breathing, diaphragmatic pressure, body action, all tend to assist in the general mixing of the gastric contents.

There are still many things unsettled about gastric action. After reading all the literature I could get, with my personal observations, I think the logical conclusion is that chemical, mechanical and nerve sensitisation are all factors vitally concerned in the functional control of the organ.

Clinical Articles

Foot Lameness.

By CARGILL PATRICK, F.R.C.V.S.
Mullingar, Westmeath.

As this form seems the most baffling of all our cases of claudication in the horse, the following may prove interesting.

Subject No. 1 was a well-bred mare, six or seven years old, a brilliant performer in her day, who during the 1933–4 season began to "go short" in her action, which gradually got worse, when treatment was urgently necessary owing to extreme pain and lameness. Being a temperamental mare, it was difficult to appraise the lameness at its true worth. Feeding, hygiene, shoeing, and stable management generally were of the best, conformation was somewhat faulty, and no doubt contributory, as the feet were both flat and shelly, with the usual accompanying weak heels. In addition to acute lameness of the near fore foot, a good deal of discoloration of the coronet at quarters and foot at heels was evident, almost suggesting frost bite, and in addition there were deep-seated corns involving the bars of foot, which were treated in the usual way, in spite of which the lameness, accompanied with much pain, continued. Foot-baths and poultices alternated, and ung. ichthyol to the coronet relieved the condition, yet did not abate it until a deep-seated suppuration matured. The resulting pus was given vent to, when the condition was supposed to have reached the climax, and recovery was expected to eventuate. The mare gradually came sound in her action, and resumed work after a spell of nearly six weeks, finishing the season fit and well, and was turned out afterwards to be brought up later, apparently sound, to begin the season 1934–5. After a few hunts in "heavy going" the same tenderness began to assert itself, and one day in a fast run the

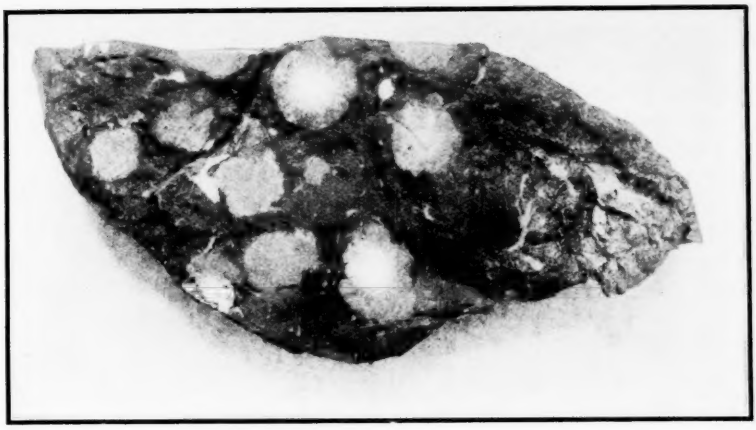
mare actually "stood up" after jumping a fence, and was got home with difficulty afterwards, showing severe pain and barely touching the ground with the lame member. The same discoloration of coronet at quarters and heels was again well marked, the heels and bars of foot were much stronger than formerly, and the corns less pronounced. In addition to the foot-baths and poultices, blistering was resorted to later, yet with no apparent benefit resulting. There is no pyramidal trouble evident, no thickening round the coronet, heat or tenderness at heel nor pain on extending the corono-pedal joint. The question resolves itself into: What is the condition present? The foot has been completely anæsthetised, and the lameness definitely located within the hoof, and periostitis of pedal bone, especially at the wings, postulated. Helpful suggestions will be much appreciated.

Subject No. 2.—A thoroughbred, five years old, gelding hunter. When brought up from grass was noticed lame on a hind leg. On careful examination the trouble was found to be in the corono-pedal region, as a good deal of heat and tenderness were noticeable without any fulness or enlargement at this stage, but wincing on pressure was evinced, which could be relied on, as the horse had a quiet easy temperament. He was in the same ownership as the last subject, and living under the same conditions, although totally dissimilar in nature. Both hot and cold water bandages were tried, poulticing with antiphlogistine, and then blistering later. The foot was carefully searched and examined, but beyond a slight ridging or buttressing at front of hoof, nothing abnormal was discernible. The lameness continued, though occasional and temporary improvements took place, until one day the horse was found very lame in his box, and signs of having been cast were plainly visible, with hoof marks on the partition due to kicking. From this time onwards the lameness became more pronounced; filling began to appear round the joint, when severe blistering was resorted to, and hoof expansion practised, as well as suitable shoeing, but so far to no purpose. This horse has been continuously lame for fully six months, and at this date the filling at pastern has disappeared, and the trouble seems to have concentrated on the toe of pedal bone. As these two cases have many points in common, though due to different causes, one is tempted to ask the question: Is it possible there may have been a fissuring of the pedal bone as a starting-point of an intractable lameness, and beyond hoof expansion and firing of the coronet, can anything further be done short of neurectomy, which is out of the question in Subject No. 1?

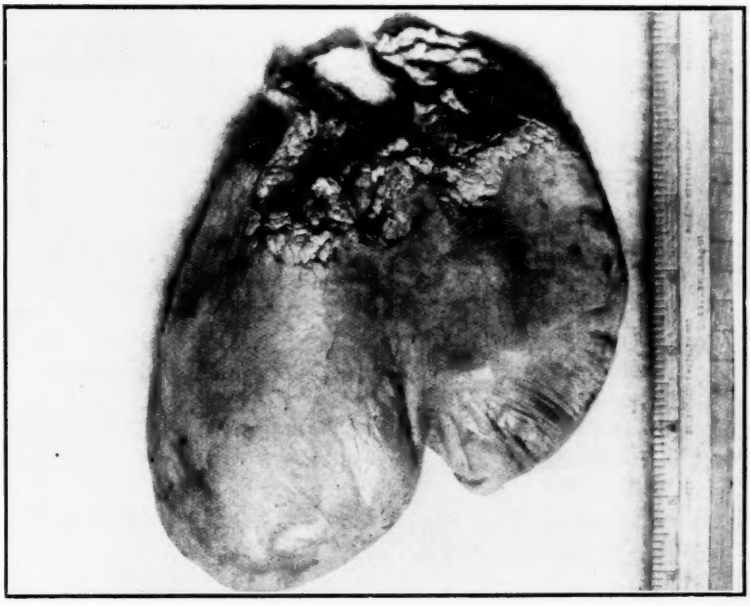
A Complicated Case in a Mare.

By PERCY WELCH, M.R.C.V.S.
Saffron Walden.

A BLUE roan cart mare at a farm near here went off her feed for two days. As she appeared to be "stiff in turning," as the owner expressed it, I was asked to see her. I found her showing unmistakable signs of pleurisy, and temperature 105° F. She was at the time given an ammon. carb. ball, and linctus for the



Bacillary Necrosis of the Liver in a Cow.



Double Gall-Bladder of an Ox.

(*Articles by* Major F. L. Gooch, F.R.C.V.S., *page* 83)

tongue. On visiting a few hours later, one pound of mustard mixed with one and a-half pints of vinegar was applied to the chest, brown paper over it and a rug put on. Four ounces of mag. sulph. in the drinking water. This treatment was continued for a few days, until the mare started to pick a little hay, and temperature got down to 103° F., where it remained for a fortnight. Potassium iodide was put in the water, as this was the only reasonable way of giving medicine, excepting quinine linctus on the tongue. During the third week of illness an urgent phone message came one evening to say she was swaying about. Death was approaching and she died during the night. A neighbouring veterinary surgeon made a post-mortem, and found lungs solid, well-marked signs of pleurisy, and an unexpected sight: the liver was one mass of tuberculosis, and a large growth just under the kidneys, doubtless tuberculous. I never remember seeing a case like it, and it was well worth a post-mortem.

Ailing Bulls.

By PERCY WELCH, M.R.C.V.S.
Saffron Walden.

A LOW-LYING dairy farm near the River Cam, which in wet seasons is often flooded, has in a well-littered straw yard twelve heifers, ages from eleven to fifteen months old in the pink of health and condition, and lick marks on the coats; it is apleasure to see them. In the adjoining yard, under similar conditions, are three young shorthorn bulls about the same age, all these young things were born on this farm and all fed alike. The bulls have swollen and stiff hocks and knees, disinclined to walk, and have to be made to get up to go to the trough to feed. All these animals are having crushed oats, bran and grass hay, and the bulls, in addition to this, are having about two ounces of bone flour once daily. Cod-liver oil has been tried by the owner, and they have also had potassium iodide in the drinking water. Up to now the treatment has been useless, and my prognosis is not very favourable. I should feel grateful if anyone would suggest a useful remedy.

[These cases appear similar to those of *Polyarthritis Rheumatica*, as mentioned by Dr. Weber in his book—"Die Krankheiten des Rindes." He mentions as treatment one and a-quarter ounces of salicylate of soda three times daily, or 30 grains in 170 minims of water subcutaneously. We think also rubbing the joints with Lictor would do good.—G. M.]

Rupture of the Serratus Magnus in a Jersey Heifer.

By A. W. WATERS, M.R.C.V.S., and
A. W. PEYTON, *Class C, Royal Veterinary College, London.*

WHEN first observed, this heifer was unable to bear any weight on the affected leg. The lameness appeared to be due to rupture of the serratus magnus, or other muscles holding the scapula in position. The actual shoulder-joint appeared

undamaged, and could be flexed quite freely. But when the animal moved the scapula moved beneath the skin with a sliding motion, allowing the body to drop on that side until the animal's nose nearly touched the ground. At the same time the cartilage of prolongation and the top of the scapula protruded quite six inches above the line of the vertebral column, and also moved away from the chest wall as far as the skin would allow. When the animal was standing at rest the scapula almost resumed its normal position, and at no time did the injury appear to give any pain.

History.—This heifer had been out at pasture with several others, and it was thought that she might have injured herself in mounting one of the other heifers which had come in bulling. Whatever it was, it happened during the night, since she was sound in the late afternoon when last seen, and dead lame the next morning.

A Puzzling Case.

By Major F. L. GOOCH, F.R.C.V.S., J.P.
Stamford.

On August 15th, 1934, I received a phone message asking me to see a cow at a large farm eight miles from the infirmary. On arriving at the farm I found a crossbred Hereford cow that had been sucking calves standing in a shed with its head pressing hard against the corner wall. Upon examining further I found the cow was totally blind, and would continuously keep its face pressing against the wall. Pulse very quick and temperature 104° F. I was informed by the herdsman attending, that the cow was one of forty that had calved and were running with the calves in a large grass field, and was only observed unwell that morning. Knowing that a large quantity of belladonna grew in the neighbourhood, I at first suspected belladonna poisoning, but was informed that there was no belladonna growing where the cows had been grazing. I administered an aperient drink, and left four doses of medicine containing sulphate of copper. I visited again the next day, and found very little improvement.

On the evening of the 16th I received another phone message informing me that another cow was in a similar condition ; on arriving I found the second cow totally blind, but was salivating, with excessive tympany of the rumen. I administered this cow an aperient, and left more doses of sulphate of copper. I again visited the premises on the 17th, and found the first cow affected improved, standing in the centre of the shed, still blind, but not pressing head against the wall, and pulse and temperature only slightly above normal. Not so the second cow, she was still salivating and much more tympanitic. I tried to pass a probang to reduce the tympany, but found some obstruction in the œsophagus just at the entrance to the thorax, and although I tried several times to pass the probang I could get it no further. I therefore inserted a trocar and cannula into the rumen and reduced the tympany. I continued the medicine, as I was still suspicious of belladonna. I again visited the premises on the 18th, and found

No. 1 cow improving, but No. 2 cow worse. My son and I made an extensive examination of the fields where the cows were grazing, but could find no belladonna, or any other poisoning plant, except a few pieces of bryony in the hedge; but there were crab-apple trees in the field, with immense quantities of apples, and many of the young branches of the trees had been pulled off and eaten, and no apples were found on the ground. On the 19th I again visited the farm: No. 1 cow regaining her sight, free action of the bowels, and was moving about her box, although very stiff. No. 2 cow was still tympanitic and salivating, and she died during the night.

I made a post-mortem examination next morning, and upon opening up the œsophagus I found a wound in the mucous coat, and nearly through the muscular (just at the extrance to the thorax) made by a piece of flint stone, flat, and just over 1½ inches square; on opening the rumen, scores of similar stones were found, but not quite so large as the one found in the œsophagus; all other organs were healthy. I took the œsophagus with the stone in position to the Royal Veterinary College. No. 1 cow made a complete recovery in about ten days.

What was the cause of the illness?

Double Gall-Bladder.

By Major F. L. GOOCH, F.R.C.V.S., J.P.
Stamford.

The plate accompanying this issue of the Journal is of a gall-bladder found by me in the liver of an ox, during inspection of meat in the slaughterhouse. I sent it to Dr. Minett, of the Research Institute, and he informs me that there are two complete gall-bladders, each containing gall, and quite separated from each other.

Bacillary Necrosis.

By Major F. L. GOOCH, F.R.C.V.S., J.P.
Stamford.

On December 22nd, 1934, I was asked to visit a cow that was grunting. The history of the cow (up to the time of my visit) as given by the owner, was that for some weeks the cow had apparently had several attacks of indigestion with loss of rumination. The owner had treated the case himself for about a month, but profuse diarrhœa set in, and as he could not stop it, he sent for me.

I examined the cow, which presented the following symptoms: grunting, acute diarrhœa, moved with difficulty, and when in a recumbent position was not inclined to rise, no rise in temperature, but pulse much increased.

From the history of the case and from the symptoms then presented I informed the owner that in my opinion some foreign body—a piece of wire, or something else, was present somewhere in the alimentary tract. I administered an aperient

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drink, and gave diffusible stimulants and antiseptics. I saw the cow every other day until the 28th, and examined the heart each time, looking out for those diagnostic sounds peculiar to traumatic pericarditis, but none presented themselves. The owner saw me on the 29th, and informed me that he was not going to spend any more money on the cow but allow her to take her chance.

She was found dead on the morning of January 3rd of this year, and I made a post-mortem, feeling certain I should find some foreign body, but I was doomed to disappointment.

I could not make a very good post-mortem, as I had to make it on the knacker's lorry, but on opening up the abdominal cavity I found an enormous mass of yellow, thick substance which was firmly fixed to the abdominal wall on the right side and to the diaphragm, and when cut into I allowed to escape several pints of yellow translucent fluid. There appeared three separate cavities containing the fluid, and after the fluid had been allowed to escape, an enormous liver was seen—I should think at least four times its normal size; and when cut into the substance of the liver presented the appearance as presented in the photograph. I cut out a slice and forwarded it to the Research Institute of the Royal Veterinary College, and upon slides being prepared I was informed that the histological condition showed " bacillary necrosis."

I have recorded this case because, except for the diarrhœa, no diagnostic clinical symptoms presented themselves to show there was disease of the liver of so extensive a nature. At no one time was there any discoloration of the visible mucous membranes, and certainly no signs of any icterus. Although the appetite was very irregular—eating one day and refusing to eat the next—the cow ate considerable quantities of food up to the day before her death.

An Interesting Case of Foreign Body in the Stomach of an Alsatian Bitch.

By Major F. L. GOOCH, F.R.C.V.S., J.P.
Stamford.

In October, 1932, I was asked by a client to examine an Alsatian bitch. The history given by the owner was that the bitch had been playing with an ordinary india-rubber ball, and after a time the ball could not be found, and he asked me to examine to see if she had swallowed the ball. I carefully examined and manipulated as well as I could the region of the stomach, but could detect no foreign body, and as the bitch presented no disturbing symptoms, and apparently was not suffering any inconvenience, and the owner being a poor man, I did not recommend X-ray examination, but told the owner to let me know at once if any bad symptoms presented themselves. I saw the bitch with its owner several times afterwards, but she appeared perfectly well and healthy.

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In November 1934, the owner brought me the ball, which he was certain was the same ball that the bitch had been playing with two years previously, informing me that she had vomited it that morning. I examined the ball and found it to be $1\frac{3}{8}$ inch in diameter, and for about a quarter of an inch into its substance it was soft and easily pulled apart, as if it had been macerated for some time in some fluid substance.

I learned at least two things from this case: First, in my opinion it is very difficult to reach the stomach of the dog from the outside and manipulate it for the presence of any foreign body; and, secondly, that a dog can retain in his stomach a fairly large foreign body for a long time without presenting any symptoms of its presence, and without giving any signs of inconvenience to the dog itself.

Poisoning by Carbon Tetrachloride in Sheep.

By R. HUDSON, F.R.C.V.S.

Retford.

EARLY in February, 1934, a farmer was advised to dose his flock of seventy ewes and one first shearling ram for liver fluke. The ewes were big and strong, on good pasture, on to which mangolds were carted for their consumption. There had been no previous deaths and they would be due to lamb about April and May. There was no evidence of fluke disease. The flock was housed on the Friday evening, fasted and dosed with capsules of carbon-tetrachloride on the Saturday morning. During Saturday and Sunday the sheep walked about like drunken subjects. On Monday they appeared all right again, all but five—four ewes and the ram—which died on the Sunday. Three were sent to the knackery, and the knacker reported that the intestines were badly inflamed. He could not find any flukes. On Tuesday, February 7th, I made a post-mortem examination on two. Outwardly putrefaction was advanced.

Small Intestines.—Externally and internally inflamed. The mucous membrane badly inflamed and the contents blood-stained. *Abomasum.*—Mucous membrane inflamed in both. In one it was covered by a white diphtheritic deposit which could not be scraped off. On the peritoneal covering there was present a red rash-like discoloration. *Spleen.*—Enlarged and full of blood, which may be due to putrefaction, but I have never seen it so large. *Liver.*—Not enlarged, not cirrhotic, nor showing thickening of bile ducts as in fluke. Only one parasite was found, and it was a mature one. *Lungs.*—Congested; showed Strongylus rufescens patches, otherwise they were normal.

This was a particularly strong healthy flock, fed under normal conditions, and one wonders why such a mishap should have happened. There was evidence that most of the animals were seriously affected, and I think the owner was lucky to escape with a loss of five only.

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COLCHICINE AND TUMOUR GROWTH.*

By E. C. AMOROSO, M.D., D.Sc.,
Lecturer on Histology, Royal Veterinary College, London.

THE finding of considerable numbers of mitotic figures in the hæmopoietic organs of normal healthy animals and in the neoplastic tissues of tumour-bearing animals after colchicine administration has led many students to suspect an inter-relationship between mitosis and the alkaloid. But the effect of colchicine in slowing down the rate of growth of neoplastic tissue has not been reported.

Following on some earlier observations (unpublished, 1927) which I made in conjunction with the late Professor M. R. J. Hayes on the beneficial effects of deep X-ray therapy on neoplasms in patients suffering from acute attacks of gout, which were being treated with colchicum, a series of experiments was recently planned with the object of determining to what extent the colchicine might affect new growths.

In one of these, a group of twelve tumour-bearing mice (*M* 63) were injected subcutaneously on alternate days with small doses of colchicine (kindly supplied by the director of the Wellcome Bureau of Scientific Research, where the work was carried out). Treatment lasted for a period of two weeks. Twelve other tumour-bearing mice were used as controls. The tumours at the end of the first week showed much less growth as compared with the controls; while at the end of the second week there was no macroscopically recognisable tumour tissue present in 66.6 per cent. of the injected animals, and only minute nodules could be detected in the remaining 33.3 per cent. These nodules finally showed complete regression, and no tumour tissue could be recognised eight weeks later. The controls in all but one instance showed a marked development of the tumour. In another series, the percentage of animals in which there was no recognisable tumour tissue at the end of two weeks was 100 per cent.

From the effects observed in these tumour-bearing mice, it was thought advisable to determine what effects, if any, could be obtained in dogs with spontaneous tumours. Of several dogs treated or undergoing treatment with colchicine, the changes observed in a spontaneous tumour in the peritonsillar region in one of these animals is sufficiently striking to warrant recording.

Case history: Sealyham, eleven years old. Difficulty in swallowing biscuits observed about August 26th, 1934. By September 30th, a marked tendency for holding his head on the left side had developed. On November 19th, it was difficult and painful to open the mouth. The difficulty in deglutition had increased, and the animal was unable to bark. On examination there was seen an ulcerated tumour on the left side of the buccal mucous membrane just ventral to the anterior pillars of the fauces on the left side, about the size of a walnut. The dog was admitted to the Royal Veterinary College on December 19th, 1934, and injections of colchicine were begun, following on the clinical diagnosis of

* Reprinted by permission from *Nature*, February 16, 1935.

epithelioma. Injections were continued on alternate days, and on January 9th, 1935, a small portion of the tumour was excised for histological examination. The clinical diagnosis was confirmed. The administration of colchicine was continued, and the tumour inspected daily. There was a progressive diminution in the size of the growth, and on January 29th only a small scar remained at the site of the original growth.

These experiments are being continued with various transplantable tumours, and a number of animals with spontaneous tumours are being treated with colchicine.

The significance of these and other facts relating to the effects of colchicine in man and other animals, as well as the effects of such agents as X-rays and radium in combination with colchicine on new growths, will be published and discussed in collaboration with Dr. G. M. Findlay, of the Wellcome Bureau of Scientific Research, to whom I am indebted for facilities and assistance in carrying out this research.

Abstracts of Current Literature

Pasteurellosis in the Swan. By VERGE and PLACIDI. *Rev. Gén. de Méd. Vét.*, Tome xlii, No. 504.

A FIRST outbreak of the disease was noticed in 1929 in an important swannery. In spite of uncertain clinical and experimental diagnosis it was considered to be due to *Pasteurella aviseptica*. Specific vaccination (auto-vaccine) stayed the course of the epizootic. The immunity conferred was quite ephemeral, and the malady reappeared in the swannery in June, 1930. The number of swans at this period was twenty-eight, all white: three adult couples, and twenty-two cygnets born in 1928, 1929 and 1930. Pasteurellosis developed in a peculiar way, without any particular symptom calling attention to it; a first swan is found dead on June 5th, a second on June 8th, and three others on June 9th. The mortality continued without interruption until July 26th, causing the loss of eighteen birds, young and adult. Symptoms have always been vague, and only evident in two or three swans: dulness, dejection, inappetence. The malady from the outset showed a subacute form, and the animals were often found dead without anyone suspecting infection. Autopsy only showed septicæmic lesions: black badly-clotted blood; congestion of the lungs, liver and spleen.

Called at a time when many birds were dead, we isolated from the blood of several cadavers, *Pasteurella aviseptica*, easily identified by its morphological, cultural and biochemic characters. The germ kills the rabbit by subcutaneous injection in twenty-four hours in a dose of one-twentieth of 1 c.c. We prepared a formalinised vaccine, beginning from a culture in Martin bouillon eighteen hours old. We injected the ten surviving birds in the pectoral muscles (five adults and

five cygnets) with half a cubic centimetre of formalinised culture on August 2nd, and repeated this inoculation with a double dose on August 10th. No complication ensued. The mortality was stayed, and since this period the health of the birds has been perfect.

The Resistibility of the Development Stages of Strongylides Outside the Animal Host.—By KARL ENIGK (1934). *Arch. f. wiss. u. Prakt. Tierhlkd.* Vol. 67, p. 363–376.

THE killing of Strongylides in the horse, the larval forms as also the sexually-ripe worms, presents great difficulties. On this account the fight against the development stages outside the animal host possesses great value. The larvæ of Strongylides are very resistant to physical influences. Enigk in his investigations has established a four and a-quarter years' lease of life ; this period will not be wholly reached in freedom. The always recommended annual change of meadow has no result. It is, however, shown that frequent thawing and freezing of the larvæ injures them severely. Dried, actively living larvæ are carried abroad with the wind ; they also remain uninjured in stacked hay. By packing dung they are soon killed when temperature reaches above 70° C. Disinfectants, on account of quantities necessary, are not economical to kill larvæ in dung. For the stable, Enigk recommends alkalysol (1 per cent.). Streaking the stable walls with carbolineum to a height of 1½ metres makes the spreading or wandering of the larvæ impossible. For destruction of the larvæ on the pasture, the tests of the author have shown that artificial manures are useless. Only by nitrogenous lime is a diminution of the larvæ to be expected. Also liquid manure has no effect in comparison with old liquid manure with a high urine content. The best effect was shown by copper sulphate (0.5 to 1 per cent.). There is no danger of poisoning horses by this procedure. Collection of the dung from the meadow every two or three days is advised.

Reviews

Text-Book of Meat Hygiene. By Professor RICHARD EDELMANN, Ph.D., translated by Professors John Mohler and Adolph Eichorniff. Pp. 474, with 162 Illustrations and 5 Coloured Plates. Sixth edition. London : J. & A. Churchill. Price 28*s*.

THE mere fact that it has passed into a sixth revised edition is sufficient proof of the great value and popularity of any scientific book, especially when its contents are of a purely technical public health nature, and this is the accomplishment which has been brought about by Edelmann's " Meat Hygiene." Within its 474 pages there is compressed a wealth of knowledge, practical as well as theoretical, and every graduate whose daily duties involve meat inspection should have this book as a work of reference on his bookshelf. To the student, both on the veterinary

as well as on the medical side, the book is not only a fund of valuable information, but also a *liaison* between the two branches of comparative medicine. Professor Edelmann is a master hand at his work, and his book is evidence not only of his perseverance and knowledge, but also of his popularity with his fellow men. The first chapter is devoted to the origin and source of meat food—a striking testimony to the value of the veterinarian and his place in the meat inspection scheme. This is followed by a dissertation on the morphology and chemistry of the principal tissues and organs of the food animals. The production, preparation and conservation of meat, with the U.S.A. regulations governing meat inspection, and the organisation of the methods of procedure for inspection. A very interesting thing to the lay mind is the reason for the decisions which the veterinary inspector gives when condemning and disposing of bad meat. The whole of the machinery which up-to-date civilised countries enforce for promoting clean meat inspection in properly licensed and equipped abattoirs is described in later chapters, and the case of the tinned and preserved foods for the use of man is fully entered into. Altogether, for the medical officer of health and the sanitary inspector it is a most excellent work of reference, and the chapter (VIII) which deals with the infectious diseases of food animals transmissible to man is in itself a source of never failing interest, as describing " in a nutshell " the symptoms of other diseases which are so often apt to be mistaken by the medical practitioner in regard to their infectivity to mankind.

Food Inspection. By HUGH MACEWEN, M.B., Ch.B., D.P.H. Fifth edition. Pp. 523. London: Blackie & Son, Ltd.

THIS book was first published in 1909, and has since been revised and brought up to date and republished until it has attained its fifth edition. Its revision on this last occasion has been done by Dr. B. W. Macewen, M.D., D.P.H., who has wisely called in veterinary expert opinions on certain chapters when needed, the respective sources being fully acknowledged in the preface. A somewhat elementary knowledge is displayed in regard to the anatomy and physiology of the domestic animals in Chapter I, but as the book is not intended as a veterinary text-book this can be understood, as also the crude descriptions of some of the diseases alluded to in Section II. The value of the central abattoir is fully claimed and substantiated, both as regards the humanity of the slaughtering and the healthy condition of the meat from being inspected systematically by trained veterinary specialists. Milk and milk products are entered into, and rather more than fifty pages are devoted to this subject alone; whilst in Section VIII there is a very clear summary of the Acts, regulations and orders relating to the inspection of food, etc. Altogether a most useful text-book and work of reference, which should always be kept handy by all meat inspectors and medical officers of health.

The Animal Lovers' Annual, No. 2, 1935. London: The Garamond Press, Ltd. In aid of the Endowment Funds of the Royal Veterinary College Hospital and Medical School. Price 1s.

THE success which attended the publication of the first volume of the " Animal Lovers' Annual " encouraged those responsible for its appearance to continue the series, with the sequel that No. 2 is now on the bookstalls, and can also, be obtained through any stationer or newsagent. As with the previous number, this one contains some 80 pages of sketches and story reading material of first-class quality—in fact a marvellous shillingsworth, and especially of the kind which appeals to animal lovers.

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Of the story writers, Miss Francis Pitt leads the way with an article entitled "Animals I have known," accompanied by photographs selected as only Miss Pitt can select them; whilst the "Zig-Zags in the Zoo," by E. V. Lucas, is full of interest and instruction to young and old alike. To those about to learn to ride, the article by Capt. F. C. Hitchcock on "The Art of Equitation," gives hints with remarkable lucidity and clearness, and it is fully illustrated. Capt. Hitchcock is, by the way, a Fellow of the Institute of the Horse by examination, and this in itself adds weight to his instructions, which are splendidly illustrated. "Swaber," by Patrick Chalmers, illustrated by B. Gough, is a sporting tale; and in "Not a Fox," Lady Kitty Vincent pays tribute to the Finnish Spitz, and, in a later article, gives a series of useful hints to those about to buy a dog. That the circus animals are not forgotten is shown by an article on "Behind the Scences at the Circus," by Bertram Mills, whose knowledge on this subject is indisputable. Michael Chance writes on "The Methuselahs of the Animals," and the story of R. S. Summerhays—"Even Into Battle," will bring back to many the memories of the commencing days of the Great War. The daily life of a greyhound is very cleverly described by an anonymous writer, under the title of "The Rise to Fame of Tricky Tooth"; and Frank Buch describes his experiences in catching wild animals under the title of "Jungle Friends in the Making." R. R. G. Browne writes on "The One Dog Man," and A. T. Pope on "Pigeons and Their General Management"; whilst "Doggy Aristocrats in Kensington Gardens," by A. P. Ryley, and an illustrated description of those of the new College buildings which are already in use, by Sir Merrik Burrell, and a most wonderful variety of sketches by Barribal, Hassall, Poy, Starr Wood, G. L. Stampa, Anton Lock (in colour), Tom Purvis, Heath Robinson, George Whitelow, G. E. Studding, Bernard Lawson, G. E. Shepheard, and the poem of the latter, bring to a close the very interesting and amusing second volume of the "Animal Lovers' Annual."

"Huic Halloa." By "SPIDER" JACOBSON. Sampson, Low, Marston & Co., Ltd.

"Huic Halloa" consists of the personal reminiscences of Capt. Jacobson, racily narrated, which make very pleasant reading indeed. The book falls into three well defined sections. First there is the early part of his life, prior to 1914, when, as a young man about town, he narrates the youthful follies of himself and his friends both in London, in France, on the racecourse, and in the hunting field. The second part deals with the lighter side of the War only. Indeed it would be difficult to imagine that there really was a war if one were to judge it from this work. The latter part of the book takes us into the realms of horses and dogs, point-to-point meetings, horse dealing, both in England and Ireland, all amusing, if sometimes unconventional. He does not hesitate to tell many a story against himself. A book brimful of interest and amusement from cover to cover that wil appeal to the expert and layman alike.

Parliamentary News

PREVENTION OF ANTHRAX

MR. R. J. DAVIES (Westhoughton, Lab.) asked the Secretary of State for the Home Department whether he would consider, with a view to the prevention of anthrax in this country, making it compulsory to disinfect all imported goats' hair at the Government station in Liverpool.

Sir F. Fremantle (St. Albans, U.) asked a question on the same subject.

Sir J. Gilmour (Glasgow, Pollok, U.).—I have now given full consideration to all the representations submitted to me, and after careful inquiries, I have reached the conclusion that the present arrangements for the compulsory disinfection of goat hair at the Government station should be extended to imported goat hair generally. It is proposed that the necessary Order should be made at the Privy Council meeting to-morrow and take effect two months hence. Answering a supplementary question about the possible effect of the Order on manufacturers who held stocks, Sir J. Gilmour said that these would not be an undue burden.

Sir F. Fremantle asked if the right hon. gentleman would have existing stocks disinfected.

Sir J. Gilmour replied that the Order would not come into operation until two months hence.

Sir. F. Fremantle.—But there are stocks which may last two years, and will spread infection right and left if the matter is not dealt with.

FOOT-AND-MOUTH DISEASE—MINISTER'S STATEMENT ON SCOTTISH OUTBREAKS.

LORD SCONE asked the Minister of Agriculture if he had any information regarding the origin of the recent outbreaks of foot-and-mouth disease in Scotland.

The Minister of Agriculture (Mr. Elliot) : Since January 17th last there have been four outbreaks of foot-and-mouth disease in Scotland. The first of these outbreaks occurred among pigs at Provenmill, near Glasgow. These pigs were fed on kitchen refuse obtained from institutions in Glasgow, but inquiries have not revealed any purchase by these institutions of produce which would be a likely source of the disease. The second outbreak occurred at the Glasgow abattoirs, and started among pigs which had been consigned to the abattoirs from the farm on which the first outbreak occurred. The third outbreak was at Coatbridge among pigs which had come from the Glasgow abattoirs. The fourth outbreak was on a farm at Rutherglen, the owner of which had recently visited the Glasgow abattoirs. An order has now been issued reducing the area of the present restrictions as from February 8th.

News

COWSHEDS IN WEST SUFFOLK—STRICTURES BY CHIEF VETERINARY INSPECTOR.

COMMENTS on the way some cows, cowsheds, and dairy utensils are kept, were made in the report of the Chief Veterinary Inspector (Mr. J. J. Gildea, M.R.C.V.S.), submitted at a recent meeting of the Suffolk Diseases of Animals Joint Subcommittee, held at the Shirehall, Bury St. Edmunds, Mr. C. C. Smith (Chairman) presiding.

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Recording his work under the Milk and Dairies (Consolidation) Act, 1915, the Milk and Dairies Order, 1926, and the Tuberculosis Order, 1925, from December 1st to February 9th, Mr. Gildea reported that he had visited 260 farms and inspected 3,884 cows. As the result of such inspection, 26 cows were slaughtered, being amenable to the Tuberculosis Order—13 having chronic cough and showing definite clinical signs of tuberculosis, eight suffering from tuberculous emaciation, and five having tuberculous udders. On post-mortem examination thirteen were found to be advanced and thirteen not advanced within the meaning of the Order. Two other cases from which milk samples were taken were slaughtered at the owner's expense before the result of the biological test came to hand, and on post-mortem examination were found to be affected with tuberculosis. From November 26th to February 9th, Mr. H. Mitton, M.R.C.V.S., assistant veterinary inspector, visited 183 farms, examined 2,189 cows, and eight animals were slaughtered, being affected with tuberculosis. "I feel it my duty," concluded Mr. Gildea, "to report that in a number of cases the dairy cows are allowed to remain in a dirty condition, no effort apparently being made to keep the cows' quarters, tails, udders or flanks clean. The cowsheds are also dirty and dark, and the dairy utensils are very often not clean. I also find that the revised copy of registered cowkeepers supplied by the sanitary authorities is no more than 75 per cent. complete."

The Chairman said that the veterinary inspectors were doing good work, and were justifying their appointment. If the arrangement did not exist, he thought the reports should be available for the public health authorities in each county.

Mr. Arthur Symonds asked if the last paragraph applied to cows inspected in West Suffolk. Mr. Mitton replied that some of the conditions were appalling.

The Clerk (Mr. Cecil Oakes) pointed out that it was for the sanitary authorities to keep the register mentioned.

Capt Walmsley said that they wanted to be sure that the inspection and the results were going to be on the same lines throughout the county. They wanted to be careful that the incidence of this Order was not bearing unduly on the farmers until the thing was got going properly.

The Clerk remarked that the officers met and considered their general line of policy.

Mr. Arthur Symonds commented that where the sanitary authority looked after these matters, the cowsheds were improved. He was rather concerned about the last paragraph of the veterinary inspector's report.—*East Anglian Daily Times.*

WARBLE PEST—COMPULSORY ACTION IN GERMANY.

THOUGH the losses caused by that common parasite of cattle, the larva of the ox-warble fly, are recognised by all stocksmen, and though it has been demonstrated by experiment and research that thorough and concerted action on the part of all owners of cattle would lead to the extermination of this pest, no really effective effort has yet been made in Great Britain to assure this objective. It is true that voluntary attempts have been made in certain districts, and that highly satisfactory results have been obtained, but it is evident that until compulsory powers are applied, so that the efforts of the progressive are not dissipated owing to the inactivity of the non-progressive, no lasting benefit will be forthcoming. Unfortunately, though the desire for a statutory measure of this nature is certainly

growing, apparently our legislators are not convinced that popular support is yet strong enough to justify the step.

Since 1926 the various State departments have been co-operating with various trade associations, *e.g.*, of farmers, butchers, leather merchants, economically interested in the problem, and, following a unanimous recommendation from the last conference of those bodies that permanent benefits could only follow appropriate legislation, the German Government promptly enacted a summary law to cope with the situation. Under the terms of the statute it is compulsory that every owner of cattle between the beginning of February and end of May, destroy all larvæ of the warble fly developing on his cattle. Further, it is provided that any occupier of land must not admit upon his land any cattle, whether belonging to himself or other party, unless such cattle are free from ox-warble larvæ, while no cattle may be exposed or exhibited at show, fair, or sale unless any developing larvæ have been destroyed. The Minister of Agriculture is empowered to issue such regulations as may be necessary for the effective administration of the measure, while parties guilty of any contravention of the provisions of the Act are liable to the imposition of monetary fines. By the application of these compulsory measures it is hoped that in a comparatively short time the warble pest will be completely exterminated throughout the German Empire, and that the heavy losses resulting from its depredations—*e.g.*, loss of condition and productive capacity in the living animals, and damage to flesh and hide in the slaughtered beast—will be eliminated.—*Glasgow Herald.*

INFERIOR MEAT—TUBERCULAR CATTLE AND BAD INSPECTION.

The National Federation of Meat Traders, in a recent conference at Southport, recently passed a resolution urging the Government to repeal the embargo on Canadian cattle coming into this country for feeding purposes.

Mr. G. R. Bennett (Manchester), who sought that open markets should be closed, said that nondescript butchers were buying inferior meat, and could sell it amidst dirt, filth and germs, and yet medical officers had no power to interfere.

Mr. Woolley (Ilkeston) asked how one could expect a sanitary inspector, who was an expert on drains, to be an efficient meat inspector. The majority of those slaughtering in this country were, however, supervised by sanitary inspectors.

Mr. J. Edwards (London) complained that there was a great deal of hawking of meat killed on farms under conditions absolutely dangerous to the public health. He had seen meat killed in a stable where the walls were reeking with gases, and in places where horses were kept. No attempt was being made to stop the killing of animals on unlicensed premises where there was no inspection.

Half Our Herds Infected.

During the afternoon session Mr. Adams, President-elect, moving a resolution urging the Government to adopt measures to eradicate tuberculosis from the herds of this country, declared that at least 50 per cent. of dairy herds were affected by tuberculosis. The Government had made some, but rather feeble, attempts to deal with the question. The Canadian Government were determined at all costs to eliminate disease, and he wished the British Government would follow their example.

Mr. KNIGHTSBRIDGE (London) said they should not let the statement of Mr. Adams go unchallenged. They knew, however, that almost all animals had a touch of tuberculosis in some form or other.

Mr. Dudley Edmonds (London) contended that the farmers were responsible for 80 per cent. of tuberculosis cases.—*Manchester Guardian.*

ANIMAL DISEASE TOLL.

DISEASES among animals and poultry cost the British farming industry £15,000,000 a year. One of the Government's good deeds for 1935 is to start a campaign to remove this scourge and to back it with cash. Money thus spent is far better than assisting with subsidies. Remove disease, and both farmer and consumer will benefit.—*The Leader.*

Correspondence

THE ATTESTED HERD SCHEME

To the Editor of THE VETERINARY JOURNAL.

SIR,—The "Attested Herd Scheme" was inaugurated by the Ministry of Agriculture on February 1st, 1935. This scheme is based on Jordan's report, and is *voluntary, i.e.,* there is no compulsion used to bring in milk producers, but they are to be enticed to do so by the promise of 1*d.* per gallon extra for the milk so produced. The cost of freeing the herds is so great that one can visualise a dead loss for several years to the producers who try it. The only producers who will take advantage of this scheme will be those who already have clean herds, and they are usually people who can well afford it. From what I know of the psychology of milk producers, this voluntary business will not materialise, the restrictions imposed as to bringing in fresh cattle, isolation of reactors, both in buildings and in pastures, will put the scheme out of court. Farmers are so well organised by the National Farmers' Union, and so "hot under the collar" owing to the "levies" per gallon on their milk, to which they are subjected by the Milk Marketing Board, that two or three years' tuberculin testing, the cost of which has to be borne by them, will be the very last thing they will think of. I predict a failure of the Ministry's Attested Herd Scheme. Producers cannot afford it. An eradication scheme must be national. An eradication scheme must be rational. Complete eradication by means of tuberculin testing is *impossible.*

In an eradication scheme there are so many points to be considered. It is well known that human beings, swine, poultry, dogs, cats, rats, rabbits (and other vermin) are subject to tuberculosis, and that the different forms by which they are affected are transmissible to bovines. The human type is proved to be transmissible to bovines, and is responsible for the no-lesion reaction. Swine are known to be subject to all three types—human, bovine and avian. Dogs, cats, rats, etc., are all subject to tuberculosis of various types, and will provide sources for re-infection of bovines. That being so, an eradication scheme must include them too, and this to my mind makes it impossible to avoid re-infection. *It will reduce the incidence of the disease, but it will not eradicate it.* This is proved beyond contradiction by results obtained in America, where an eradication scheme has been in force for a number of years. The American reports are full of contradictions as to the incidence of the disease, but they are unanimous as to the results. The initial infection was low, said to be 4 per cent. In the ten years from 1922 (1921 in some cases) the incidence in the tested herds fell to 1.4 per cent. This 1.4 per cent. had either been left undiagnosed, re-infected from some of the sources which I have mentioned above, or they were occult cases which

had advanced to the allergic stage, *i.e.*, to the stage where they would react to tuberculin. Taking this reduction as an argument, and the incidence of the disease in this country as 40 per cent., then it will take exactly 100 years to reduce the disease to 1.4 per cent., and even then there will be three cattle in every two hundred to carry on the work of re-infection.

The sum set (and figures are said not to lie, but at the same time they can be made to prove anything) is this: If it takes ten years to reduce 4 to 1.4, how long will it take to reduce 40 to the same level?

Routine inspection, plus vaccination of calves, should be the method employed to eliminate this disease. Tuberculin testing begins at the wrong end—*prevention* is the ideal method.

As regards the tuberculin test in America, it is open to doubt if the method adopted is the right one: 1/20 instead of 1/10 c.c. of tuberculin is used, and *only one intradermal injection is made.* This method must leave a doubt in some minds that many cases are left unrecognised, for anyone who is at all familiar with tuberculin testing knows that in very many cases a reaction is not obtained by the sensitising dose of tuberculin. Whilst Dorset, of America, was investigating the merits of "synthetic" tuberculin against broth-cultured bacilli, he carried out tests on 13,288 cattle, and obtained 9 per cent. reactors with the former.

In 1933, 13,000,000 cattle were tested—reactors were 2 per cent., or 65,000; therefore, instead of 65,000 reactors there ought to have been, according to Dorset's findings with synthetic tuberculin, 9 per cent., or 292,000, and the cost accordingly increased to $58,000,000 from the $13,000,000 actually paid.

Tuberculin testing has failed (*see* also *The Times* Agricultural correspondent's letter, January 21st, 1935, page 18, para. 4), and the cost has been enormous. The entire cost to America up to date has been $300,000,000, or about £80,000,000.

Illinois is the latest State to be declared "free." Testing has been going on for fourteen years. At the start in 1921 the incidence of disease was heavy. In 1926, five years later, it had been reduced to 8 per cent. Nine years later it was reduced to 1 per cent., due to the *immediate destruction of reactors*, and declared "free," although 1 per cent. still reacted. If this State is retested in three years, as it will have to be under the American scheme, it will be interesting to see what the percentage will be.

A fact to be remembered is this, that although at least 40 per cent. of the bovines in England and Wales will react to the test, only 2 per cent. of our dairy cows give tuberculous milk. This fact is vouched for by Sir George Newman, C.M.O., of the Ministry of Health in his Annual Report. Another fact to be taken into account in this eradication scheme is that there will be in this country two Ministers chasing the same hare. The Minister of Health, producing "Certified" and "T.T. Milk," and the Minister of Agriculture producing "Attested Herds" by the same methods. Rather a waste of effort, time, and money.—I am, Sir, yours faithfully,

J. W. H. MASHETER, M.R.C.V.S.

Personal

MR. J. A. MILTON, B.Sc. Agric., M.R.C.V.S., has been appointed staff instructor in veterinary hygiene under the Glamorgan Agricultural Committee.

MR. L. EDWARD PERKINS, one of the assistant veterinary officers under Durham County Council, has been appointed chief veterinary officer to Cornwall County Council.

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Whole-time appointments made recently:

MR. JAMES A. SPENCE, M.R.C.V.S., Kendal, has been appointed county veterinary officer for Westmorland in succession to Mr. J. Brennan, who has been appointed to a similar position under the Lancashire County Council.

MR. J. C. BENNISON, M.R.C.V.S., D.V.S.M., F.C.S., and Mr. W. A. Milligan, M.R.C.V.S., D.V.S.M., have been appointed whole-time Veterinary Inspectors for the County of Dorset by the Dorsetshire Agricultural Committee.

MR. GEORGE AUGUSTUS BUSHMAN, sixty-nine, of Islington, veterinary surgeon, left £12,791 (net personalty £6,830).

MAJOR JOSEPH ABSON, D.S.O., F.R.CV.S., Sheffield, late Treasurer of the Royal College of Veterinary Surgeons, who died last November, following a motor car accident in Sheffield, left £35,981, with net personalty £35,539.

ROXBURGH County Council, meeting at Newton St. Boswells, agreed to appoint Mr. J. Forrest, at present County Veterinary Officer for Selkirkshire, as the Veterinary Officer for Roxburghshire under a joint scheme with Selkirk County.

MR. EDWARD MACNAB, M.R.C.V.S., has been appointed to the lectureship of Veterinary Hygiene at the East Anglian Institute of Agriculture, Chelmsford, one of the most progressive research organisations of its kind in British agriculture.

MR. JOHN BRENNAN, M.R.C.V.S., who several months ago was appointed Westmorland's first County Veterinary Officer, has now been appointed to a similar position by the Lancashire County Council. It is understood that his work in Lancashire will be principally concerned with sheep scab.

MR. SYMON SHARP, M.R.C.V.S., D.V.S.M., has been appointed veterinary inspector, meat inspector, and inspector of dairies, cowsheds, and milk shops for Barrow at a salary at the rate of £500 per annum, rising, subject to satisfactory service, by annual increments of £25 to £575 per annum.

MR. W. D. MACRAE, M.R.C.V.S., D.V.S.M., who has for some years held the appointment of Assistant Veterinary Inspector for the County of Midlothian, has been appointed County Veterinary Inspector, in succession to Mr. J. N. Ritchie, B.Sc., M.R.C.V.S., D.V.S.M., who has received an appointment with the Department of Agriculture for Scotland.

THE Gold Medal " for distinguished services to sculpture " has been awarded to Captain Adrian Jones, M.V.O., M.R.C.V.S., by the Royal Society of British Sculptors. This medal, on the lines of that of the R.I.B.A., was founded in 1923, and is the highest distinction which British sculpture can award. The previous recipients have been the late Sir Hamo Thornycroft, R.A., Sir Alfred Gilbert, R.A., and Sir William Reynolds-Stephens, P.P.R.B.S. Capt Adrian Jones, whose ninetieth birthday was recently celebrated at a festival given in his honour by his brother artists, was recently awarded the highest honour the Council of the R.C.V.S. can bestow—that of the Hon. Associateship.

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